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VERITATEM PER MEDICINAM QUÆRAMUS

From Mrs White
to
Dr. Orgel
Hackensack 1918

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# ELECTRICITY
# IN
# HEALTH AND DISEASE.

Containing the Solution of the Problem of Tuberculosis
in the United States.

THE author is one of the most illustrious teachers of electro-therapeutics in America.

—Medical Sentinel.

FROM such a practical observer and teacher as Dr. Monell one must accept his results as from one qualified to dictate.

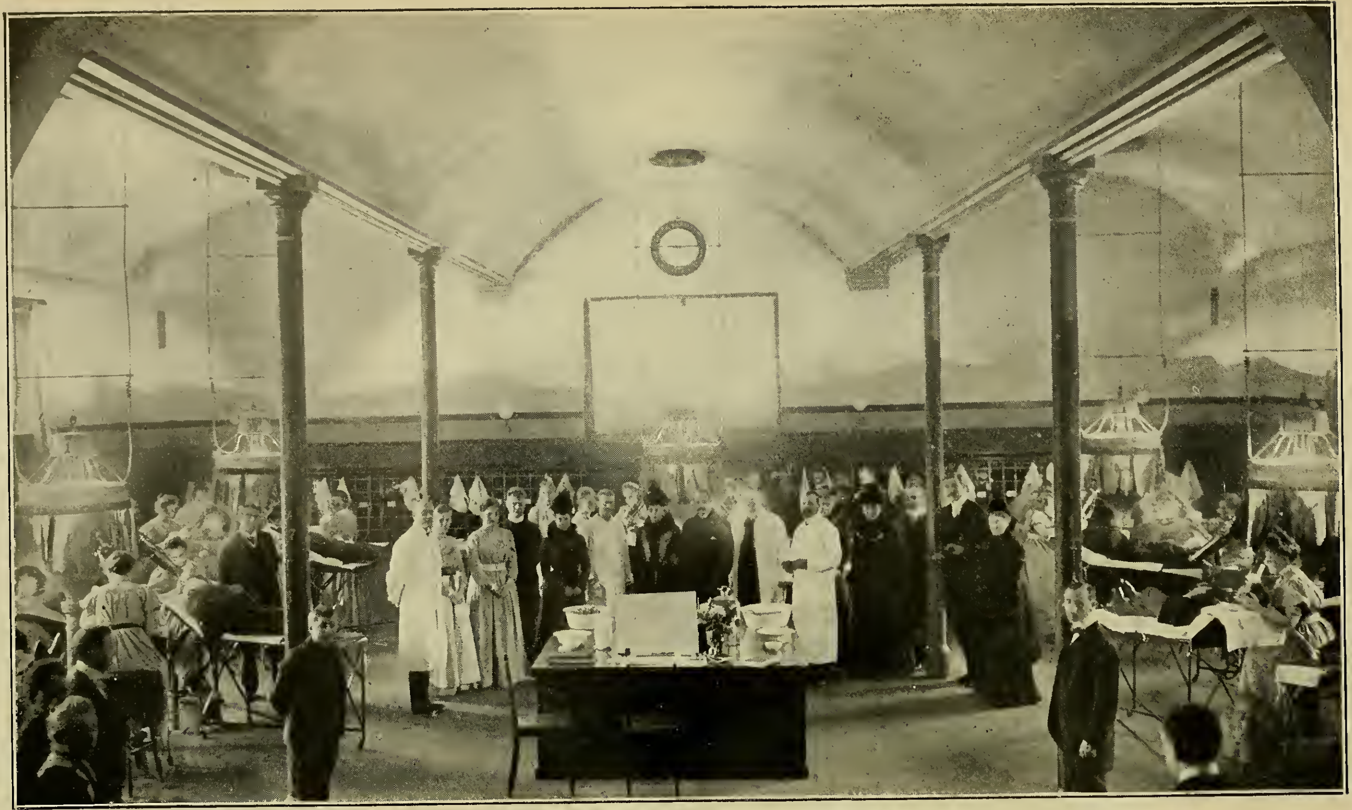
—Canada Medical Record.

DR. MONELL is regarded as one of the foremost thinkers of the medical world, and in electro-therapeutics has done more for static electricity than any other living man. His voluminous writings have made for him a living history. His books on the uses of electric currents in X-Ray work and in electro-therapeutics have had an enormous sale. As author, teacher, scholar, he is at the top.

—The American X-Ray Journal.

WHEN PROFESSOR MONELL issued his work upon static electricity, it was taken up by the medical profession as few books upon electro-therapeutics have been, and almost from the day of issue became the work of reliable reference with not only multitudes of general practitioners, but also with the specialists in this line of medicine, and especially with the medical teachers of America. When the announcement was made some weeks ago that a general work upon the entire subject of electricity in medicine was in process of preparation by Dr. MONELL, a stir of interest passed over the profession, and the mere announcement that the work has now been published will bring for it a very large sale. The work stands forth as one of the most striking medical productions of 1897.

—Medical Sentinel.



THE ROYAL FAMILY OF DENMARK IN THE FINSEN LIGHT INSTITUTE

This picture is a souvenir of the author's visit to the Finsen Institute and is doubtless the only one in America. The great room contains eight four-tube instruments, of which five are seen in the photograph. The Royal Family and the medical staff stand just behind the central table. The central figures are the present King and Queen of Denmark, with both of whom we conversed at length on the work of this famous institution in which all Denmark is interested. Its main medical interest centers in the treatment of lupus, a rare disease in America.

# ELECTRICITY IN HEALTH AND DISEASE

A Treatise of Authentic Facts for General Readers, In which is shown how Electric Currents are made to act as Curative Remedies, Together with an Account of the Principal Diseases which are Benefited by them. Presenting also the Solution of the Problem of Tuberculosis in the United States.

BY

DR. S. H. MONELL

NEW YORK

*Lately Professor of Static Electricity in the International Correspondence Schools and Founder and Chief Instructor of the New York School of Special Electro-Therapeutics; Member of the New York County Medical Society; Editor, "Journal of Treatment"; Author of "A System of Instruction for Physicians in X-Ray Methods and Medical Uses of Light, Hot-Air, Vibration, and High-Frequency Currents"; "Manual of Static Electricity in X-Ray and Therapeutic Uses," "The Treatment of Disease by Electric Currents," "Elements of Correct Technique in Electro-Therapeutics," Rudiments of Modern Medical Electricity," "The Cure of Writers' Cramp," "The Modern Light Bath and Some of Its Modifications," etc.*

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# PREFACE

Six millions of people in this country are yearly concerned with the personal problem of how to get well or keep well. Almost every one has a general knowledge of the fact that electricity can be used with great advantage in some diseases, but few are aware of the vast scope of usefulness which modern scientific appliances have developed. There is indeed a well-founded and wide-spread belief that electricity is a valuable aid to medicine, but many do not yet know what diseases it can be made to relieve or cure.

The general public for the most part knows electricity simply as something for light, power, and commercial use. The Electrical Engineer knows his currents in phases, cycles, volts, and terms of copper. He works with mathematics and metals, neither of which have nerves. But the physician who prescribes electricity must know his currents in terms of tissues that *feel*, that breathe, and that work constantly in their wonderful ways to carry on the processes of life.

To make these living tissues—nerves, blood-vessels, muscle fibres, secreting and excreting organs, heart, lungs, liver and kidneys—obey the laws of Nature and maintain health the trained physician whose curative resources are up-to-date must know electricity as the Artist knows his tools and what he can *make them do.*

The general need for authoritative information on this subject calls for a plain presentation of the facts. We propose to state the demonstrated facts regarding electricity as a healing agent so that they will be understood by all who read this book.

We shall show *why* electric currents influence health and disease. We shall make perfectly clear the *means* by which they become important medical remedies. We shall show that scientific *dosage* and instruments of precision leave no room for credulity and the play of imagination in the production of positive curative results.

We shall show something of how these definite and decisive results are accomplished by skilled physicians; how exact technics meet the indications of diagnosis; and how these modern refinements of method have been made possible by the ingenious construction of hundreds of assisting devices—instruments for measurement and control of current action, regulation of dose, and the effective application of treatment to every part of the human body.

Most important of all, we shall dispose of errors which have crept into perpetuating print, the irresponsible flotsam and jetsam of ignorance, prejudice, and past charlatanism in *quasi* medical writings; errors which have misled some very distinguished physicians and some very eminent electrical engineers.

Finally, every statement recorded in this book as to the benefits which medical electricity affords to patients *is sustained by clinical proof and is absolutely true.*

THE AUTHOR.

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*MEDICINE is not a rigid system of rules and formulæ as it was in ancient Egypt:—a fixed creed to which you are to subscribe and from which you must not vary. It is a living, growing thing, making use of every resource which the progress of science brings; testing all things and holding fast to that which is good.*

Dr. John S. Billings' Address to the Graduating Class, Bellevue
Medical College, 1882.

# ELECTRICITY IN HEALTH AND DISEASE

## CHAPTER I.

### ELECTRICITY'S ALLIANCE WITH MEDICINE.

The Debt of the World to Electro-therapeutics. Showing how the Electrical Engineer and all his Works were given to Mankind by Medical Electricity. For Two Centuries Medical Uses alone Preserve Electricity from Oblivion. How Doctors made possible the Dynamo.

THE world was 2,500 years in finding the first useful occupation for the spark that Thales discovered in the amber, and when it was found it was found in the practice of medicine. Electricity has ever since been the most fascinating and the most elusive subject in the domain of medical literature.

Modern invention makes it the foremost and chief remedy of the materia medica apart from drugs, but in comparison with the billion dollar growth of the dynamo and its offspring the physician's "battery" seems insignificant to the general reader. Yet, to the old alliance of electricity with medicine a hundred and sixty years ago the world owes all that it now enjoys of modern electrical development.

To the art of medicine and to scientific investigators of "medical electricity" we are indebted for the immortal Faraday, for Morse, Edison, Brush, Bell, Elihu Thomson, Tesla, Sprague, Weston, Stanley, Steinmetz, Cahill, and their achievements—for the telegraph, the telephone, the electric light, electric traction and power, electro-chemistry, the new and amazing Telharmonium, and the thousand electro-wonders of this twentieth century.

That old alliance so near forgotten is a romance of demonstrated facts and small beginnings, and the way of it was this: In the year 1600 Dr. Gilbert, an Englishman and court physician to King James I, re-discovered the frictional spark and by ingenious experiments revived the interest of the world in electricity. Then a Prussian named Otto Guericke in the land of amber placed a ball of sulphur on a revolving axle, subjected it to friction, and the first "electrical machine" was born. This started the ball rolling and gave investigators something to work with. For lack of it the unforgotten but never advanced discovery of Thales two thousand years before had slept like the *genii* of Arabian tales, its potential energy locked in a casket.

In 1675 the famous Sir Isaac Newton contributed his mite to the scarce hatched science of electricity, and thirty years later Hawksbee improved the Guericke machine as an experimental apparatus. In 1729 Stephen Grey discovered that electricity, until then studied only in the form of a spark discharge, could be conducted as a "current," and he successfully conveyed it 666 feet in experiments which foreshadowed the Morse telegraph of 1844.

A thousand tests of electrical action were made. Scores of scientists in the universities of Europe pursued the attractive study. Then, in 1746, came the epoch-making event from which medical electricity dates and upon which rests every electrical achievement since. This event was the construction of the Leyden jar. This simple metal-coated glass jar, now scarcely used at all, startled Europe in 1746 much as the *x*-rays did two hundred and fifty years later. It made a remarkable noise in the world and the date of its invention is the most important landmark in the history of early electrical progress. For these jars were employed to *condense* and accumulate the discharges generated by the feeble "Static Machines" of that day, and besides exciting the amazement of observers they made the medical uses of electricity possible.

Immediately there was a great desire to test this remedy in the treatment of all diseases that resisted the action of drugs and in 1749 Jallabert of Geneva published a treatise on the medical application of electricity in which he reported a cure of long standing paralysis of the right arm. This result was obtained in about three months, and history records it as "the first decided and unquestioned cure of the kind obtained in electro-therapeutics."

A year later Nebel produced contractions of muscles by electricity and Bohadtch of Bohemia used it in the treatment of

GILBERT
(1540-1603)

First distinguished between electrical and magnetic attraction, and showed that electrical attraction is distinct from the substance of electrified bodies. Demonstrated almost all of the properties of the magnet.

paralysis. In 1753 a Swedish physician named Lindhult reported a cure of epilepsy with this new agent and in 1755 the pendulum was in full swing. Everybody who could get hold of a generating apparatus was using Static electricity. Franklin performed his various medical experiments as well as his better work with the kite and lightning rod, but abandoned the study because his practical mind could find no way to harness his captured lightning to mechanics and the treatment of patients did not appeal to him. Franklin's electrical researches, communicated by letters to his friend Collinson and thence throughout Europe, were to bear their best fruit later when he carried the cause of the American Revolution to the court of France.

At this same time (about 1756) DeHaen reported a large number of "electric cures" of paralysis, spasmodic and nervous affections, menstrual suppression, and St. Vitus' dance. Schaeffe and Nebel also published cures of rheumatism, toothache, hypochondria, paralysis of the optic nerve, and of intermittent fever and neuralgic pains; and Spry reported in addition a case of lockjaw.

The important result of this growing use of electricity in medicine, the only field in which any use for it yet existed, was a demand for *improved* electrical apparatus. The improved Static machine of Ramsden was invented in London in 1768, remained for years the most efficient frictional apparatus made and performed almost all the therapeutic work reported in the electro-medical literature of that seed-planting period. From the same medical incentive and demand there sprang later in successive steps of progress the voltaic pile, the chemical cell and induction coil. Still later, the induction static machine and the dynamo. Without the medical demand we should have had none of them.

The scope and importance of the medical work done with "electrical machines" from the year 1755 to 1800 can only be realized by research into the writings of that investigating age. It is evident from the records that "medical electricity" did not begin its career with "quacks." Nor with ignorant men. Integrity, practical sense, high position, sound judgment, and scientific attainments marked the men whose early studies of the physiological action of Static electricity form the permanent basis of its medical value; and it would be hard to find abler men in their line than Professor Remak and the celebrated Duchenne.

In the year 1800 Galvani and his contraction of the frog's leg drew all scientific interest to Italy. The disruptive discharge of the Leyden jar was succeeded by the first real electric *current* and the possibilities of an Edison faintly dawned on the new horizon.

The study of what the nomenclature of the time called "galvanism" became the popular furore of the day. Italy, France, England, Germany, Europe and America, united in developing the discovery. Volta lectured before Napoleon in Paris and was crowned with the highest honors of the French Institute. The great Genius of war pronounced "galvanism" his favorite branch of peaceful study and offered a prize of sixty thousand francs to the one who should next equal the discoveries of Franklin and Volta.

The popular interest in the wonderful galvanic current in 1801 rivalled the popular interest in *x*-rays in 1896. To study the new device a splendid throng of great chemists and experimental philosophers gave their time, and if the casual reader of to-day imagines that travelling quacks were the originators of medical electricity he has only to note the list of extraordinary men who pursued with infinite labor and with wonderful zeal the path pointed out by the Italian genius, Volta.

It is sufficient to cite among these men the names of the great Priestley, Cavendish, Humboldt, Oersted, Ampère, Sir Humphrey Davy, and the forever shining name of his immortal pupil, Faraday. The disciples of Volta and Galvani were both numerous and illustrious.

The new current possessed electrolytic power and upon nerve and muscle tissue exerted a tonic action peculiar to itself. When it was found that it would "galvanize" into motion the muscless of an apparently lifeless body and that it would re-vitalize with nervous force an apparently exhausted nervous system, some held it to be the source of life and an error which it has taken years to eradicate crept into print and gave rise to the legend of the Frankenstein.

Electricity is now known to act upon all the physiological processes of the body as well as upon muscle fibres, and recent investigations affirm that it is intimately concerned with conduction of nerve impulse during life, but the attempts artificially to produce life by electrical stimulation do not get far beyond the laboratory.

Up to this time it was the alliance of electricity with medicine which saved it to the world. Its demonstrated value in the treatment of disease not only provided the chief reason for the manufacture of apparatus but furnished the main stimulus to improve appliances and seek out new uses for this so-called "force." It is difficult to see what could have developed a Faraday, whose work is the cornerstone of modern electricity, if its small beginnings had not been nursed into promise, and by slow steps advanced in the one field in which it was put to use.

Take its early medical interest out of the slow growth of apparatus and what else supplied the eighteenth-century incentive to the manufacture of improved devices? And without incentive no progress could have been made. In order to interest the world in electricity it was first necessary to show that it would do some thing practical. It gave its demonstration of usefulness in the way best suited to encourage research in an era when mechanical invention was still undeveloped. Our debt to the old alliance of electricity with medicine can only be measured by the sum of its modern gifts to man.

During the first half of the nineteenth century which laid the foundations for generation, control, and application of electric currents in the industrial arts we find only here and there a fruitful worker in the electro-medical field. But before the close of the nineteenth century the essential principles had been shaped for the guidance of physicians and it only remained for the widespread diffusion of the accurate knowledge that research had ascertained.

The opening of the twentieth century found a new and greater alliance between electricity and physicians well under way. But the new alliance of this great curative agent with the modern science of medicine is a different matter from what went into history when Duchenne died. High-efficiency appliances and instruments of precision have succeeded the primitive implements of the past. The skill of the electrical engineer has contributed to the tools of the physician, and the equipment of the specialist now contains the finished products of the best designers and manufacturers. In variety, scope, and cost the modern armory of weapons with which to fight disease surpasses in the field of electricity *all other non-drug resources put together.*

# CHAPTER II.

## WHAT THE EARLY PHYSICIANS DID WITH MEDICAL ELECTRICITY.

An Interesting Account of Pioneer Clinics. The Celebrated Investigations at Guy's Hospital in London. The Teachings of Remak and Duchenne and How Time Confirms them.

Now while the foundations of electrical science were being builded upon the work begun and fostered by physicians let us, for a moment, see just what the medical world of a century ago was making electricity do for its own patients.

From 1745 to the end of the eighteenth century the only generator of "electricity" for any purpose was the frictional type of what we now call the "Static Machine." All patients were therefore treated with "Static electricity" and its actions were as closely studied as was ever quinine, mercury or opium. The character of this current we shall discuss later and explain enough about it to make its actions clear, for in expert hands it is a wonderfully valuable means of benefiting sick patients, and neither the lapse of time, nor scientific research, nor laboratory experiments, nor clinical experience, casts any shadow upon the brilliant history of Static electricity in medicine.

The nature of its actions upon the human system had been so well determined when Cavallo wrote his beautiful treatise in 1781 that but little was added to the known facts when Gull presented his Guy's hospital reports on Static electricity in 1853—and Sir William Gull was one of the foremost physicians in England. In our own age abundant experience has confirmed the findings of these earlier teachers and established the principles of treatment they laid down.

So great was the interest created by the reports of "cures" in cases that resisted ordinary medicine that many besides savants, chemists and physicians were attracted to the employment of electricity. Among them was John Wesley.

We all know that he was a man of remarkable abilities and precarious health, and his sanity of judgment is vouched for by his influence and career. The "Father of the Methodist Church" was not only one of the greatest preachers of all time but he was also an uncommonly clever amateur physician. The fact that he was convinced of the value of Static Electricity and put it to the test of use will be accepted by many as sufficient evidence that it must have helped patients to get better.

The work he did with it and what he said about it is one of the gems of medical literature. For the benefit of the people among whom his great missionary work was done he published in 1747 a treatise on domestic medicine which ran through thirty-six editions. In a preface dated November 10th, 1760, he writes: "In the course of time I have likewise had occasion to collect several other remedies, tried by myself or others. Some of these I have found to be of uncommon virtue, and one I must aver from personal knowledge *grounded upon a thousand experiments* to be far superior to all the other medicines I have known. I mean electricity. I cannot but entreat all who are well-wishers of mankind to make full proof of this. Certainly it comes the nearest to an universal medicine of any yet known to the world."

Wesley did not sit at his desk and theorize about Static electricity, as some eloquent critics have since done. He had sick poor in his parish who needed relief and he bought apparatus, opened four free clinics, and had the poor treated. The impression made upon this experienced and practical man by the effects of electricity employed under his own eyes is apparent in an entry made in his private journal. It should interest and inform a number of modern readers who surmise that medical electricity is yet in an infant stage and that Static electricity in particular is little known or used.

> "Having procured an apparatus on purpose I ordered several persons to be electrified who were ill of various disorders, some of whom found an immediate, some a gradual cure. From this time I appointed, first, some hours in every week, and afterward an hour in every day wherein any that desired might try the virtue of this surprising medicine. Two or three years after, our patients were so numerous that we were obliged to divide them, so part were electrified in Southwark, part at the Foundry, others near St. Paul's and the rest near Seven Dials. The same method we have taken ever since, and while hundreds, perhaps thousands, have

received unspeakable good I have not known one man, woman, or child, to have received any hurt thereby; so that when I hear any talk of the danger of being electrified, especially if they are medical men who talk so, I cannot but impute it to a great want, either of sense or honesty."

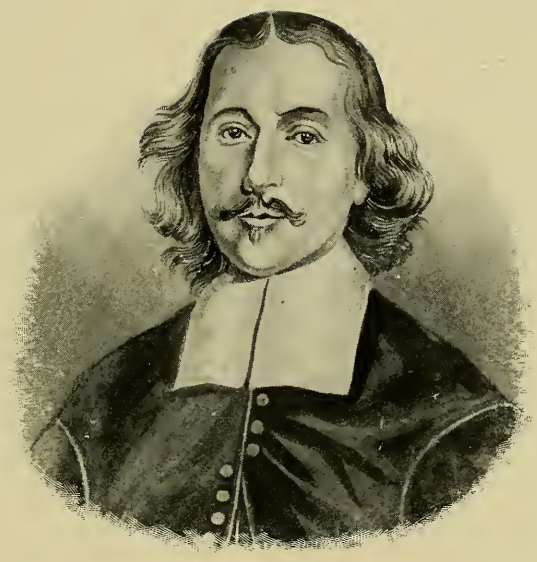
And Wesley spoke from experience, for if we remember rightly, his own life at one time was despaired of and he owed his recovered health to this same agency, just as thousands of others did in the eighteenth century and as scores of thousands do now.

In 1777 a distinguished English scientist turned his attention from studies of another sort to the study of Static electricity. After four years' investigation of its clinical results he wrote a book about it. It was a book of high merit, for the writer was a very able man. His treatise upon the subject reveals a knowledge and comprehension of the true place of this agent in medicine that is yet far in advance of the present knowledge of electrical engineers and of the majority of the medical profession. It is instructive to read the extract we now quote:

"At present a much better acquaintance with the science of electricity than philosophers had about thirty or forty years ago has pointed out the effects of this agent upon the human body under various circumstances, and shows how far we may confide in it; establishing upon indisputable facts that electricity is neither the panacea it was considered by some to be, nor so useless in application as others have asserted, but that when properly managed it is a safe remedy which sometimes instantaneously removes divers complaints, generally relieves, and often perfectly cures, various disorders, some of which could not be removed by the utmost endeavors of physicians and surgeons.

"When the first rumor occasioned in Europe by the accounts of both real and pretended wonders performed by electricity had in a measure subsided, many creditable and experienced physicians who had undertaken to examine the power of this new remedy published some unsuccessful applications of electricity in divers diseases. These publications gave a new turn to the reputation of medical electricity and since that time the generality of physicians and surgeons had not the least regard for it.

"However, an attentive examination of this subject, after several trials and after overcoming in a great measure the rooted prejudices among physicians, began to establish anew the reputation of medical electricity and showed that many of the applications



GUERICKE
(1602-1686)

Made the first electrical machine—a static generator. Discovered that light could be produced from electricity, and asserted the identity of lightning and electricity.

published in the above-mentioned accounts were unsuccessful because the treatment was not managed properly. So that it has been the *abuse* and not the use of electricity that has proved unsuccessful or detrimental. A long series of experiments and observations have proved strong shocks to be generally useless.

"Electricity, different from other physical applications, requires a nicety of operation and a thorough knowledge of disease. That it is possible to apply electricity without a just knowledge of the disorder is proved, but it must be confessed that further experience may possibly show much easier and more certain ways of applying it differently for different diseases, and therefore it is more likely that medical electricity will receive more improvements in the hands of skilful surgeons and physicians than when managed by persons whose success is largely a matter of chance.

"The superiority of electricity over other remedies in many cases will appear manifest from considering that medicines in general cannot always be confined to a particular part of the body, and to let them pass through other parts is often dangerous, for which reason they sometimes cannot be used in the desired doses. Besides, after some medicines have exerted their required power they are with great difficulty separated from the body; but it is of no consequence whether the power of electricity passes through this or that other part of the body in order to reach the site of the disease, for after having exerted its action it is instantly dispersed. Hence this explains why electricity has often cured such obstinate disorders as have not yielded to other treatment."

A hundred and twenty-five years have elapsed since these wise observations of Cavallo. Yet they are judicious and correct and may be commended to the special attention of all readers who feel an interest in this subject. Later, we meet the following prophetic remarks in an English publication of 1789, a date, be it remembered, when Static machines were the only electrical apparatus known; a date when Ohm's law was unsuspected and Faraday was not yet born.

"Since the time of this discovery (the Leyden jar, 1745) the prodigious number of electricians' experiments and new facts that have been daily produced from every corner of Europe and every part of the world is almost incredible. Discoveries have crowded upon discoveries, improvement upon improvement, and the science has ever since that time gone on with so rapid a pace and is now spreading so unusually fast that it seems as if the subject will soon be exhausted and electricians arrive at the end of their resources. But, however, the *Ne plus ultra* is as yet in all probability at a great distance, and the young electrician has a vast field before him highly deserving his attention and promising further discoveries —perhaps equally, or more, important than those already made."

No one can say that the foresight of this writer has not been justified by events in the electrical field since 1789.

But in our modern generation it has been the habit of some writers who certainly betray great ignorance of the history of electro-therapeutics, to make the mistaken assertion that the early users of Static electricity were guilty of "enthusiasm" in their employment of this agent, and of gross exaggeration in their reports of it. No reader in search of truth should be left with such an impression if he has it; and the best evidence of the conservatism and sound judgment of the eighteenth-century experts is to be found in their original reports and not in erroneous references to them. As an example of convincing caution in weighing facts and requiring proofs before accepting a new remedy we think the following extract from a book published in 1790 would not be surpassed to-day by a bulletin from the Johns Hopkins university; and because we have seen so much misrepresentation on this subject the account is well worth the space it takes and we hope no reader will skip it:

"The account of a few successful cases in medical electricity, as in other branches of practice, does by no means establish the reputation of the treatment when a vast number of unsuccessful trials are concealed from the eyes of the public. The variety of temperaments observable in the human species, and the coincidence of circumstances is such that sometimes very obstinate disorders appear to be cured by very trifling applications.

"In order, therefore, to give a proper estimate of the value of a remedy it is necessary to show the proportion between its successes and failures without being amazed at one case and neglecting many others.

"Agreeable to this observation the reader will find in the following pages an estimate of the effects of Static electricity applied as a remedy for various disorders. This estimate has been deduced from the cases which have hitherto come to my notice, and it is therefore likely to receive much alteration and amendment by better information and observation in the future.

"The application of this subtle fluid to medicinal purposes was thought of soon after the discovery of the Leyden jar and after various turns of reputation its medical virtues now seem to be pretty well established."

The writer of the above then proceeds to give an admirable and correct statement of the results of electrical treatment such as was then known in a large variety of diseases. It is a most interesting account and we wish that space permitted us to cite it here so that all might read it. His remarks close with this judicious observation: "We may lastly note that in many cases the help of other remedies is required to assist the action of electricity, which, by itself, would perhaps sometimes be useless; and on the other hand electricity may often be applied to assist the action of other remedies, such as sudorific, strengthening medicines, alteratives, etc."

A more compact statement could hardly be put together than Cavallo's "General Rules for Practice," published for the guidance of physicians in 1781. In it he says: "In judging what cases are proper to be electrified, experience shows that in general all kinds of obstructions whether of motion, circulation, or secretion, are very often removed or alleviated by electricity. The same may also be said of nervous disorders."

And the multitude of cases in which the details of treatment and results to the patients are carefully given by these early experts are more than sufficient to convince any modern reader of their writings that they were both competent and honest men, and it is not possible to-day to discredit their work by any fine skepticism based upon an utter ignorance of what they actually did and how they did it. The author of this present volume can take a modern Static machine and demonstrate on patients the truth of the early reports of electrical treatment. He can also show that they did not exaggerate the facts nor make undue claims for their results, for with improved apparatus he can *far surpass them.*

But the most famous landmark in the historical narrative of Static electricity consists of the celebrated reports of its use and the official investigations of its medical value by the physicians of Guy's hospital in London, England. These researches were conducted under the direction of Dr. Addison (1837), Dr. Golding Bird (1841), and the very eminent Sir William Gull, M.D. (1853).

Owing to the long periods covered by these investigations, the high repute and ability of the physicians engaged in them, and the enormous number of patients treated, the Guy's hospital reports possess extreme interest and the modern physician who has not read them cannot consider himself well informed on the subject of Static electricity. The same may be said also of electrical engineers who question the worth of past achievements in this line.

For technical reasons, portability, ease of operation, and smaller cost, the "galvanic" device as soon as it was developed into a practical apparatus took the place of the cumbersome Static machine in popular experiment. About 1832 the induction coil was born, giving the world a third medical current and changing for a time the whole course of electro-therapeutics. Chiefly owing to its facility as a contractor of muscle-fibre it lent itself readily to certain medical work and at once aroused the popular enthusiasm which has ever attended new electrical discoveries. It was given the name of its inventor, Faraday, and has ever since been known to physicians as a "Faradic Battery."

With the great expounder of "induction" and his surpassing work began the practical development of modern electricity in all branches. There were now three currents. Were they the same "electricity"? In physical manifestation and apparent properties they were as wide apart as heat and force. After many experiments Faraday himself demonstrated the identity in essence of all electric currents and showed that the work done by what is called electricity depended on the relative variations of pressure, volume, and resistance, and the continuity or intermittency of the given current. And these factors depended on mechanical variations in methods of generation and discharge. Everybody knows it now but he was a wonderful man who found it out for the first time.

Presently a new era in the progress of medical electricity developed with a fierce rivalry between the advocates of galvanic currents and the advocates of faradic currents. It began about the year 1840 and reached its most acute stage from 1850 to 1860. Professor Remak of Berlin founded a school of electro-therapeutics in Germany and taught that the galvanic current alone possessed medical value. The champion of France was the celebrated Duchenne, now called the "Father of modern electro-therapy," who advocated the sole use of the coil current and voiced his opinions with the zeal born of his great experience in the hospitals of Paris.

Remak was extravagant and Duchenne was positive. Each repudiated the teachings of the other. Remak practically introduced the galvanic current to the medical profession. He discovered and taught special applications and suggested a theory of its profound nutritional action upon the circulatory and nervous systems. He was the first to scientifically investigate localized galvanization of the brain, spinal cord, and the great centres of the sympathetic nervous system, and he greatly widened the sphere of electro-therapeutics.

His theories and his statements have been strikingly confirmed by subsequent investigators and are now regarded as accepted facts in the science of medical electricity, so far as they apply to the constant galvanic current.

On the other hand Duchenne took up the new instrument of Ruhmkorff and wielded its great physiological energy as no man before his time had done. The physiological and curative properties of faradic electricity were investigated by scientific men in every country; but the labors of Duchenne overtop his contemporaries in their magnitude, character, scope and exactness. He was an accurate observer and a careful experimenter, and by his thorough neuro-pathological researches and his demonstrations of electro-physiology he firmly established the induced current on a scientific basis.

Duchenne discovered, developed and perfected so completely the properties of induction currents in medicine that but little except refinement of his principles has been added since his day. His classical work was done between 1847 and 1855. He discovered the motor points of muscles, he made the distinction between primary and secondary coils, he recognized the difference in muscular effects between coils of heavy and those of fine wire, and he taught the principle of concentrating the action of the current upon the locality which he sought to influence; that is, upon the seat of the disease.

He who simply follows Duchenne's investigations finished half a century ago will review all the important physical, physiological, and pathological features of faradic electricity in medical uses. Since his death the greatest improvements have been in the mechanical construction of higher-efficiency apparatus and in the facilities afforded by new electrodes.

To limit the physician of to-day to any single electrical apparatus would be as impossible as to restrict him to a single drug. No one type of current will exactly duplicate the actions of any other. We need them all. But the work of the pioneers was done with instruments which make us admire their skill and feel thankful that their zeal was equal to their task.

GALVANI
(1737-1798)

Discovered contact electricity, but did not recognize the significance of his discovery. His greatest title to fame lies in having by his work directed the attention of Volta to the subject.

The Tools of Modern Electro-Therapy.
The Instruments of Precise Dosage
And Definite Actions Which Make Up the Sum of
Electrical Resources in the Domain of
Twentieth-Century Medicine.

# CHAPTER III.

## ELECTRICALLY OPERATED APPARATUS FOR PHYSICIANS.

The Great Scope of Electricity's Work in Medicine. Ohm's Law. The Galvanic Switchboard and its Scientific Equipment. The Meter which Measures the Medical Dose. What Electrodes Are and What They are for. The "Faradic Battery" Made Plain. The Relations of Voltage and Amperage in Electrical Treatment. Popular Fear of Voltage an Error.

We have seen how the *old* eighteenth-century alliance of electricity with physicians established the first steps of its progress and fostered research without which we should have no building of the "central station" or the "harnessing" of any Niagara to a dynamo.

But the *new* twentieth-century alliance of this great curative agent with the modern science of medicine is a different matter. High-efficiency appliances and instruments of precision have succeeded the primitive implements of the past. In variety, scope, and cost the modern armory of weapons with which to fight disease surpasses in the field of electricity all other non-drug resources put together.

"I had no idea there was so much that was interesting in electricity outside of the industrial arts" was recently remarked by a gentleman connected with a great electric light and power company after a visit to the office equipment of the author. Five or more rooms are required to hold the most necessary apparatus for proper treatment of patients. To such an office come for relief the whole range of chronic diseases and many acute conditions which do not yield readily to medicine alone. And the results are beautiful, as we shall show later. For the moment we must speak of the means by which electric currents are made into important medical remedies to supplement the materia medica of modern pharmacy.

In an uncontrolled and undirected state electricity will not cure a single patient of the simplest ill. Nor will water in a pond turn a single wheel of commerce. All the physical agents derive their working "power" from necessary mechanical devices which control and direct the given energy, and in medical practice the curative actions of electric currents are created and made useful by a growing number of inventions for administering them.

Electric currents now supply the physician with power for motors which turn his Static machines, his Oscillators and Vibrators; they supply him with selected radiations of Light energy which he employs with a variety of appliances; they excite great Ruhmkorff coils for *x*-ray and High-Frequency work, some of them containing thirty to forty miles of wire wound in upward of six hundred thousand turns and capable of raising the primary E. M. F. to over a million volts.

Electricity heats his cautery knives, it glows his diagnostic lamps, it supplies him with new potentialities in "faradic" and sinusoidal currents. It gives him the "galvanic" current in its fullest range of capacity, and gives him tub baths more tonic than any mineral spring anywhere. Electricity supersedes the Turkish and Russian bath with an improved Light bath of immensely greater therapeutic value, and by means of radiant heat it displaces the once popular hot-air methods of treatment in rheumatism, gout, sprains, etc. Electricity yields us ozone from the oxygen of water or the air, and enables us to surpass the best results of climate in the treatment of tuberculosis. It is truly the handmaiden of the modern physician and offers him as many services as he can learn how to accept.

The accessory devices mainly called "electrodes" which take part in the skilled technics of these administrations number many hundred and have enlisted an amount of ingenuity in their construction that almost equals an invention of the first class. Each generation adds to them and they enlarge the scope of treatment.

Without at least a bowing acquaintance with the chief apparatus in medical electricity it is impossible to understand how a single physical agency can serve so many purposes, relieve so many pains, and truly be what Wesley said it was, "a thousand remedies in one." The apparent mystery ceases when we see the array of transforming instruments that go far to make it equal a thousand remedies in the variety of work we can do with it. A catalogue of five hundred pages would not describe and illustrate them all, but by some brief mention of the chief appliances we can best prepare the reader to grasp the facts that our later chapters will disclose.

What we may consider the foundation instrument in medical work is the primary cell battery which gives us the so-called galvanic current. This exceedingly important medical current results from chemical action within glass jars containing a zinc electropositive "element," a carbon electro-negative element, and a solution of salts called the "exciting fluid." The chemical action that generates the current is the decomposition of the zinc by the fluid in which the zinc and carbon plates are immersed. The zinc plate is amalgamated with mercury to secure a uniform electrolytic action upon its surface and prevent irregular and too rapid decomposition.

Such a "cell" will produce a constant current of the type known as "galvanic" when conducting metallic wires from the two elements are made to form a circuit. On such a metallic "short circuit" the initial value of the current from a single cell is about 1.5 to 2 volts, and from 1.5 to 5 amperes, according to the size of the zinc and carbon elements.

For clinical treatment this amperage is too much and the voltage far too small, for the moment the resistance of the patient's tissues enters the circuit Ohm's law divides the voltage by the resistance and thus reduces the net current in the now altered circuit. Medical practice deals with so great a variety of patients and local lesions that resistances run all the way from 10 to 2,000 ohms, and the requirements of dosage vary from one-tenth of one milliampere up to 250 milliamperes. From fifty to sixty large improved primary cells are therefore necessary for the work of a physician's office.

For convenience these battery cells are usually placed in a neat cabinet, on top of which is the *switchboard* to control the current. This part of a fine apparatus has grown to be an instrument of precision and beauty of construction. By means of it the trained physician acts upon the tissues with a visible record before him of what he is doing and he can regulate the dose to the fineness of a hair. By means of it the patient is safe-guarded from the slightest possibility of accident and from all risk of pain. The function of this current is to remove pain and not to cause it, and in competent hands it many times turns agony into restful sleep.

For the reason that some medical applications will require only two or three cells to supply sufficient current, while others will require ten, twenty, or fifty, the first accessory of the galvanic switchboard is a *cell-selector* switch. For the further reason that the galvanic current must be under fine control and the quantity increased and decreased gradually, the next need of the switchboard is a *rheostat* so that the gradations of dosage may be free from sudden starts and disagreeable sensations. "Never hurt a patient" is the cardinal rule of the skilled operator.

Of equal importance is a device which will record for us the action of this silent current which gives no notice of its energy to the ear and hence a *Meter* is an indispensable necessity. In general estimation the rapid progress of galvanic therapeutics during the past fifteen years is ascribed to the accuracy in dose measurement afforded by the milliammeter. It is this single instrument of precision, adopted universally by physicians within fifteen years, which is held to have lifted the galvanic current from the uncertain empiricism of the past and given scientific exactness to its modern employment.

This instrument is a calibrated galvanometer, which had its origin in Oersted's discovery in 1820 that a freely suspended needle is deflected by the passage of an electric current in its neighborhood. Owing to the feeble electromotive force of the constant current from primary cells, an enormous range of uncertainty enters into every galvanic application without a standard meter in the field, for the actual "current strength" from the same number of cells and using the same electrodes, will vary greatly with the resistance of the skin, so that apparently similar gross conditions, such as using the same number of cells as for previous treatment, are no guide whatever to similar doses and effects for the next treatment.

If two physicians simultaneously conducted the same application with the same apparatus upon exactly the same tissues, the single difference of wetting one set of electrodes in plain hot water and in the other case adding about two per cent of bicarbonate of soda to the water, would make such a difference in dosage as would be incredible to any one not familiar with skilled technique. The actual value of the medical dose can only be determined by the meter and this fact renders it indispensable to the physician.

The galvanic current in a "continuous" flow has its unapproached and splendid field of action in electrolytic and nutritional influence upon the tisues and for the relief of pain; notably in the diseases of women. But by adding an automatic "interrupter" to the switchboard we obtain an interrupted galvanic current for

VOLTA
(1745-1827)

The era of modern electricity began with Volta. His great discovery of the voltaic cell enabled electrical energy to be generated for the first time in appreciable quantity, and thus started modern electrical development.

the contraction of muscle-fibres and special work which it does better than any other form of interrupted current. In cases of paralysis in which the wasted muscles have lost their power to react to the small amperage of faradic currents the massive quantity under each impulse of the broken galvanic current can often be made to restore the use of a limb when nothing else will. The rate of interruption can be regulated at will to suit the state of the given muscles; the quantity and voltage can be adjusted to the work required, and the grasp of this current then on the contractility of elastic fibres surpasses that of any other agent known.

A "pole-changer" to reverse the polarity of the current at will without removing an electrode is also a necessity for the switchboard. Terminal "binding posts" are provided for the attachment of the conducting cords which take the current from the apparatus to the patient. The Galvanic Battery is then complete.

Within a few years there has grown up a large business in the manufacture of what are called "Wall-plates," which are switchboards designed to control and adapt the current from the street mains to medical uses. But the 110 volt direct current, although often called the "continuous current" is by no means the "constant" current of the primary cell. It cannot be made to satisfactorily cover the same field of medical work as the galvanic cell current. It is in fact a broken current, and although, as in a fine mosaic, the pieces may be very closely put together, yet the cracks show and the tissues kick. No reduction of the voltage to ten or less will yield the comfortable tolerance of a cell current of five times the E. M. F. Yet the street current medical apparatus has advantages in its way and most physicians make it a useful part of their equipment. But its limitations should be understood. It should also be understood that the "portable" red acid cell galvanic battery is fit only for a few emergency uses and is not a complete instrument for high-class work.

Before passing to the subject of another type of apparatus we must show how it is that a current of any form of electricity can be made to set up such a variety of actions in the tissues and be applied to meet so many different conditions. The devices of the switchboard enable us to manipulate the current at will and the devices which enable us to apply it in a hundred ways are called *electrodes*. Every type of medical apparatus is dependent for its value to patients on these direct means of applying treatment. *Electrode* is derived from two Greek words which signify an electric *way*. The definition given in the classical Century Dictionary is as follows: "A pole of the current from an electric battery or machine which is in use in effecting electrolysis; applied generally to the two ends of an open electric circuit. The positive pole is termed the *anode* and the negative pole the *cathode*."

This definition gives no hint of the real character and purpose of medical electrodes, which constitute the various *ways* by which we get the active energy of the current into the tissues. The pair of "sponges" with wooden handles or pair of metal grips usually furnished with cheap faradic batteries are mere toys and without value in the treatment of patients. As fully five hundred different electrodes are required for the extensive work of a skilled medical practitioner it is necessary to know what they are and what they are for. Let us therefore see.

An electrode is made up of a conducting surface to make contact with the tissues, a suitable handle for the physician to hold it by, and a means of attaching it to the insulated conducting "cord" which brings along the current from the generating apparatus. They range in size from needles to a bath tub, and in shape from a point, spiral, or urethral sound, to a flat pad that will cover the abdomen; from an eye cup to a hydro-electric douche; from an olive dilator or rectal bulb to the vaginal bi-polar electrode of Apostoli. They are made of many materials. Their number is legion and their uses, so as to command desired effects, is the life-long study of technics.

Without a variety of suitable electrodes the therapeutic results of galvanic, faradic, high-frequency and other currents are as impossible as would be surgical results without cutting, dissecting, and suturing instruments. Apart, also, from the material of which any electrode is made it is obvious to the physician that it must conform itself to the size and shape of the parts to be treated and the dose of current which it serves to conduct. Medical effects and the comfort of the patient are regulated by the *density* of the current for a given area of contact-surface and not by the total amperage. A lump of butter that will spread a biscuit thick will spread a large slice of bread very thin, and the same principle applies to the distribution of electric currents by the area of the contact surface of the electrode used.

We will now glance a moment at the most widely known and most extensively used apparatus connected with the field of medical electricity—the induction coil. Eight things contributed in the early days of modern electro-therapeutics to make the faradic battery for a time almost the only type in general use.

1. Its compact size and cheapness.
2. Its obvious energy as a muscle stimulator, with a single cell.
3. Its freedom from destructive injury to tissues.
4. Its apparent (and delusive) simplicity of action.
5. The work of Duchenne.
6. The undeveloped state of other electro-medical apparatus prior to 1885.
7. Misconceptions of the medical profession and the public regarding electricity and neglect to study its demonstrated properties.
8. A prejudice, the strangest and most unwarranted in medical history.

These factors wane as electrical science advances. We know now that the sum of electro-therapy requires all currents. We know now that each current has its special sphere of action in which it is supreme. We also know that the many thousands of so-called "medical batteries" and "family batteries" sold every year to the laity and to some untrained physicians are only capable of coarse muscle stimulation and are as little fitted for scientific electro-therapy as they are for *x*-ray work. The cheapest is the dearest.

"Faradic" currents are the product of mechanical devices which transform the direct electrical output of chemical cells. They involve the process called *induction*. An induced current of electricity is generated in a closed wire circuit placed near to, but not in contact with, another circuit through which a current is passing. The galvanic current is directly conducted from the cell to the patient, but in the faradic apparatus the cell current is first passed through a device on the switchboard which alters its character and action. This device which changes the galvanic into a faradic battery consists of two essential parts: an induction coil and an interrupter. But to possess curative value both the coil and the interrupter must take on new qualities of workmanship and design wholly unknown to the construction of the cheap "family" apparatus.

In a "Faradic" battery the primary cell current passes along a conducting wire to, and through, the coil of copper wire wound spirally around the bundle of iron rods which constitutes the magnetizable *core* of the primary induction coil. From the moment the primary current is modified by this primary coil it ceases to be a galvanic current and becomes an induction current. The distinction between these two cannot be too clearly understood by physicians or the laity.

Meanwhile a second conducting wire from the opposite element of the cell conveys the current to the second component part of the faradic transformer, which is the *interrupter*—a finely balanced hammer head on a delicate vibrating spring, not such as you hear coarsely buzz on the common five, ten, or twenty dollar commercial faradic box, but the finished device of the scientific medical instrument of far higher cost and infinitely higher efficiency.

The head of this spring approaches the attracting end of the magnetized iron core in front of it when the cell current acts through the coil. The reverse surface of the spring presses against the stationary and highly polished platinum *ball* of the finely made device when the current stops and the magnetic core ceases to attract.

There can therefore be no faradic type of medical current without the succession of "makes" and "breaks" set up by this method, and this constitutes one important difference between coil and cell currents. But the complete device must do more than merely "interrupt" to transform the direct current into an induced current, for an interrupted galvanic current is in daily use. What the faradic device does is to practically transpose the relations of voltage and amperage—pressure *vs.* quantity—and alter the predominating quality of the output from chemical to mechanical.

The current comes out of the first coil with much higher E. M. F. than it went in, and with its amperage reduced to a very small value; and when a second induction coil is placed over the first the second inductive process carries the current to a still greater height of voltage and proportionately attenuates the current volume. From this fact we derive the means of stepping up the desired medical dosage through a series of wires of different sizes and lengths composing a compound secondary coil of variable inductance capacity, or of a set of separate coils answering the same purpose.

Experience has determined the preferred size of wire and the approximate number of turns required to supply the fullest range of dose for all-round medical work. And it must always be remembered that their important function is to supply the requisite dosable current for the particular case in hand. Without accuracy in dose the practice of medicine is unthinkable, either with electricity or drugs, and having selected the proper coil for the given work the next device we need for regulating the current is a *rheostat.*

We need two: one for the primary circuit and one for the secondary circuit. The Author's high tension induction apparatus—the improved faradic battery—regulates the primary circuit by a resistance wire rheostat, and the higher voltages of the compound secondary circuits by an original device consisting of two glass tubes, one containing a low resistance fluid and the other a high resistance fluid calibrated on a scale up to one million ohms. This, the first and only successful secondary circuit rheostat ever put into a faradic battery, was devised by the present author in the early part of 1894 and was tested for three months and calibrated by Francis B. Crocker, Professor of electrical engineering, Columbia college, New York, whose letter stating its qualities is published in one of my large text-books for physicians written in 1897.

By means of these competent controllers the current, with the full coil in action, is always started at zero, with no sensation to the most delicate tissues until the skilled and gentle development of the dosage reaches its proper measure.

In addition to the *rapid* interrupter which we have described and which breaks the current from 15,000 to 30,000 times per minute according to its adjustment, our high-class faradic battery also has a *slow* interrupter for entirely different purposes. This can be adjusted to break the current any desired number of times from 30 to 500 per minute. This slow interrupter never is seen on an inferior apparatus and yet it is absolutely essential to correct treatment of many muscular conditions. The apparatus is further supplied with a pole-changer, all necessary switches, and six standard dry cells. The compound coil is wound in sections of three sizes of wire aggregating about 8,000 feet in length, with a total of 15,000 turns.

This handsome and high-efficiency induction apparatus is now complete, but before using it for the cure of disease the physician must first make a practical study of the elementary technique of the great legacy of Michael Faraday. This technique demands a thorough knowledge of the following things:

1. The proper adjustment of the rapid vibrator so that it will work with a perfectly smooth, fine, even and continuous action, and with the proper note of almost silent musical hum. The *character* of the sound denotes the *quality* of the interruptions of the current, and a coarse interruption will not do fine work in the human tissues.

2. The differences in voltage and volume of currents stepped up through coils of different sizes and different lengths of wire—short and coarse wire, medium calibre, and fine No. 36 wire of 1,000 and 1,500 yards in length,—these having a fundamental relation to scientific dosage and the production of definite actions upon nerve and muscle tissue—the keynote to treatment.

3. The physiological actions of this familiar but too crudely used form of medical electricity. The physician who expects to succeed with his administrations of electric currents must be as familiar with "physiological actions" as is the mariner with his compass.

In the special classes of instruction to physicians which the writer taught for six years he was accustomed to enforce this lesson, rarely studied by careless practitioners, but which contains the key to a clear understanding of the *therapeutic value of different coils, and the reason why a variety of coils is indispensable to the competent treatment of patients with faradic currents.*

The demonstration requires a current controller in the circuit of the *secondary* induction coils, for the direct coil current involves the use of the unrestrained maximum energy of the given coil in every application and test, subject only to variations in the primary exciting circuit or in the extent of coil employed. *But by passing the induced current first through a scaled rheostat we can restrain the maximum voltage to any desired degree and make a scientific study of the characteristics of the different coils.*

Details of these tests and actions are fully taught in my clinical treatise for physicians written in 1900, where any one interested may read them. To all who work out these principles the clinical significance of the set of approved therapeutic coils becomes apparent. It is seen that they provide different degrees of dosage by differences in the *driving force* and *thickness of blow* struck in the tissues; some carrying it further than others when diffusion is needed and some stopping short of others when narrower *localization* is needed; some affording small dosage when delicacy is required; some furnishing the means of increasing the same current to suit also the needs of larger administration.

With the aid of the rheostat they enable the operator to scale the dose with scientific exactness to procure the definite effects and to set up the special actions in the tissues that will benefit the disease. As essential dose-regulating devices these divisions of coils not only give us control of *voltage*, but they enable us to reduce the *amperage* when little is required, or to increase its volume when more is required, without compelling such alterations in the *primary circuit* as would impair the smooth working of the interrupting spark gap, or cut the metal of the spring by an excess of electrolysis.

And owing to the general confusion of mind in the reading public as to the effect of *volts* this is a good place to explain the facts, for it is so customary to read in the papers sensational reports of incidents in which volts are the only electrical items which figure, that an unwarranted fear of the misunderstood has arisen. Conditions can make a million volts as safe as ten: they can make twenty volts do work that a thousand will not do under other conditions; danger from electricity is not a question of any number of volts *per se.*

*Amperage* will do work of great range almost independent of voltage. *Voltage* will do no work at all without amperage. To illustrate this we may remove the condensers from a Static machine having 16 revolving plates, each 32 inches in diameter, capable of generating at high speed an E. M. F. of a million or more volts. Placing now our hands upon the opposite poles and making a short circuit through our body we find that the tissues feel *nothing.* The "voltage" may indeed be high, but a high wind may also drive a grain of sand with great speed against the body and the mere speed effects nothing, for the missile has no *weight.* But imagine the effect of the same speed driving a projectile weighing an ounce, a pound, a hundred pounds, a ton!

Going to the other side of illustration, let us scale down the voltage of a given current possessing at first say 100 volts and a quantity of 5 milliamperes, scarcely enough to be felt through the body when applied with wet electrodes 4 x 6 inches in area. But reduce the circuit resistance. Let the *volume* rise on one side of the balance as the *volts* drop on the other. The *amperage* does not lose its electrolytic action; on the contrary, it gains the more as its volume swells and presently, when scarce any *volts* are left, the amperage becomes a *cauterizing* agent that will sear tissues for the surgeon if he employs it through a platinum loop. Sheer *volume of current* with a minimum of volts is capable of enormous action if utilized in the right way.

If both voltage and amperage—force and volume—were *fixed values* that could only be diminished or increased together in *equal proportion* we could not use electricity with safety. The *elastic flexibility* of its great powers would be lost. Neither factor alone is a therapeutic weapon minus the other. Both combined vary the action *in proportion as their ratio varies, and the power to alter their ratio at will is a large part of our means of regulating dosage in medical practice with electric currents.*

The physician should so familiarize himself with these primary facts that his mental picture of ohms, volts, and amperes, is as concrete and definite as is his conception of pounds, horse-power, and all the common units of quantity in daily use.

A *pound* is a purely arbitrary term agreed upon to express a unit of weight, and the discrepancy in size between a pound of feathers and a pound of lead does not impair our conception in the least. We can neither see, feel, nor count a billion, but we form a mental picture of the value behind the word that serves for the practical application of business. So it is with the units of electrical measurement to those who use them.

One sentence more as we leave the faradic battery and the physics of induction: The *voltage* of a *secondary-coil current* is proportioned to the *amperage of the primary-cell exciting current* governing the degree of *magnetic saturation* of the bundle of inducing iron rods, multiplied by the number of *convolutions of wire* wound around the secondary spool, divided by the internal *resistance.*

# CHAPTER IV.

## FURTHER APPLIANCES FOR PHYSIOLOGIC THERAPEUTICS.

How Modern Science is Aiding the Physician in the Conquest of Disease. The Means by which Electric Currents become Important Medical Remedies. The Latest Products of Invention Applied to the Benefit of Patients.

THE value of electricity in medicine during all its eventful career from the eighteenth to the twentieth century has never been *over*-stated. The real truth is beyond the estimates of any writer who has given us an authentic medical treatise on this subject. And because this is so it is necessary to prepare the reader for our own therapeutic chapters which are to follow by first describing some of the means which enable skilled physicians to accomplish results often deemed wonderfully brilliant by their medical colleagues. The basis of these results is necessarily an equipment of modern apparatus.

The greatest recent incentive to improvement in all varieties of electro-medical apparatus was Roentgen's accidental discovery of the *x*-rays. Competition and an increased market have spurred each manufacturer to surpass his rivals and the result is an immensely superior supply in every form of device for the medical employment of electricity. Crookes' tubes that were mere curiosities of the physical laboratory when Roentgen first photographed the invisible are now veritable works of art in their wonderful construction and efficiency: induction coils that were then seldom seen in any high-class and large construction have been developed to an undreamed of efficiency and thousands have been sold with spark ratings of twelve, twenty, thirty, and more inches. The electrolytic interrupter followed in the wake of the *x*-ray and is one of the amazing things that astonish by their simplicity—after we know them. Owing to the influence of Roentgen's discovery upon medical and surgical interests we shall give the place of honor in this chapter to the *x*-ray coil.

This type of apparatus had no place in the field of medical usage until it was needed to excite high vacuum tubes, but it has since become one of the most important and valuable instruments in the electrical armamentarium of both physicians and surgeons. It is made in many designs and qualities, but is essentially either a Ruhmkorff or a Tesla type of transformer, with accessories which adapt it to its work.

A high-class induction coil with, say, an eighteen inch spark rating, is a superb piece of electrical construction. About thirty-five miles of copper wire goes to the making of its secondary, winding it with more than six hundred thousand turns to create the very great E. M. F. required. It is excited by from five to twenty-five amperes of street current. This feed supply is controlled by a large rheostat and registered by a standard meter. Switches enable the operator to make it obey his will and we can adjust its energy to a great variety of tubes by means of the "variable inductance" construction of the primary.

This adaptability to both large and small work is secured by winding the primary induction coil in several divisions and connecting the sections with a terminal switch so that we can allow the current to pass through one, two, three, four, or six of these, according to the action desired; for the tension of the secondary closing current increases in direct proportion with the amount of primary tension, and in almost inverse proportion with the amount of self-induction in the primary coil. The demonstration of this principle witnessed an immediate evolution in tubes and interrupters.

As the lighting of a high vacuum tube with *x*-radiance is dependent on an intense bombardment with broken particles of current the output of this great transformer must be interrupted by a device which will break the primary current with certain sharp, sudden and intense qualities, and the efficiency of the entire and costly apparatus depends very largely upon it. Magnetic, mercury, electrolytic and spark-gap interrupters are all employed, and a fine apparatus will usually be fitted with two types to permit a choice in different grades of work.

Few of the laity and not many electrical engineers are aware of how much research, thought, outlay of money and tests of practical experience have gone into the development of this really scientific instrument of precision, and it is necessary to impress upon the reader the resourcefulness of modern makers and the

AMPERE
(1775-1836)

Founder of the mathematical theory of electricity, and that part of the science of electromagnetism which deals with the attraction and repulsion of electric currents.

splendid quality of apparatus which we now possess in order to make clear the sound basis on which medical electricity now rests. It has become an unrivalled curative and diagnostic agent because unrivalled inventions have made it *scientifically usable.* What the public sees labelled in shop windows as a "medical battery," price $3.50, or perhaps, $5.00, has its apotheosis in *x*-ray coils costing the physician from $500.00 to $1,000.00 when complete.

In marked contrast with the ordinary type of induction coil apparatus is the "Closed Magnetic Transformer" and Tesla type apparatus which is also made of high efficiency for similar uses. Its cost is about the same and in the best designs it has some advantages which are peculiar to itself. It combines great facility of manipulation with durability, economy of current and high therapeutic value.

And this brings us to the subject of "High-Frequency" apparatus, one of the new developments which add a new right hand to the many resources of electricity in medicine. We began to hear of this form of electric current about 1891–93. For the next three years it was in the stage of investigation. The most scientific physicians in Europe and a few in this country made thousands of tests with it and determined its physical and physiological properties. During 1897–1901 the apparatus rose on the wave of *x*-ray development, and with more powerful currents at command it fast demonstrated a great and attractive clinical value. Many began to use it and reports of its results increased in medical literature. At the present time it is an accepted *indispensable necessity.*

But what is it? Is the High-Frequency apparatus a new *battery?* What does the name signify? What are its uses in the physician's hands? There is no mystery about it and these questions are readily answered.

What is called the High-Frequency apparatus is a *transforming attachment* for *x*-ray coils and Static machines. It is designed to alter the quality of the secondary-coil current into a more refined current with special therapeutic properties and dosage, which, when successfully accomplished, enables the expert operator to add another string to his medical bow—a fascinating weapon to his quiver.

This simple statement will bring the matter down to the level of ordinary understanding and remove much of the vagueness now in the general mind as to the nature of this valuable instrument. Past references chiefly copied from French writings on "*Action des Courantes de Haute Fréquence*" have signified as little to American physicians as music to the deaf; but once see the apparatus, see it work, witness its effects, test it on patients, translate its language into practical therapeutics and office practice, and the thing that was unknown before becomes alive with interest and commands immediate admiration.

A "High-Frequency" current is one which is in a state of rapid oscillation during its flow. This rapid to-and-fro vibration within the current is caused in all forms of the apparatus by the disruptive discharge of a *condenser*. The discharge may appear to the eye to be a single spark, but it is made up of a number of successive sparks, following each other with such extreme swiftness that they are said to oscillate (change their direction) millions of times per second, a speed that the eye cannot note. Prof. J. C. Bose produced a current which changed its direction 50,000,000,000 times in a single second, a rate quite sufficient to justify the use of the term "high frequency" to indicate this form of electrical discharge.

Every high-frequency current is also a current of high potential as compared with galvanic and faradic currents, and this enables them to act on open circuit. The combination of extremely high voltage with short and rapid vibrations also has the effect of producing phenomena which almost seem magical to those who have handled only the faradic battery. For instance, we see it light up an incandescent lamp with a single wire, light five incandescent lamps with current passing through the human body, with no sensation to the person, and send current through two inches of solid glass, besides the usual action upon vacuum tubes.

The capabilities of energy and penetration manifest in the above phenomena have their most useful application in the treatment of diseases in which the nutrition of the body needs to be improved, the nervous system reinvigorated, and the physiological functions made to perform their duties. They are exceedingly agreeable to patients and go far to turn electrical treatment into a luxury.

Electric baths of various kinds also increase the scope of treatment with the different currents and adapt them to the better employment of large doses in special conditions calling for a general constitutional action upon the patient. They possess great value and although formerly of poor reputation they have profited by the improvements of modern construction and are now placed on a scientific basis. In skilled medical hands they are beyond criticism.

For the full water-bath the tub is made of a non-conductor, glass, porcelain, or wood, and insulated from the earth by the removal of all metallic groundings. By far the best material is glass and in the writer's equipment the necessary insulation is provided by four inches of hard rubber between the outlet and the drain pipe. No metallic connections anywhere touch the tub.

In this tub the patient rests in a large body of warm water and by means of special electrodes the action of the indicated current is directed through the entire body or through localized tissues as desired. The selection of the current (galvanic, faradic, or, sinusoidal) is made upon the same diagnostic indications as in other prescribing of electricity, and the regulation of the dose is governed by the usual rules of practice. Electricity, in the bath tub, does not take on any *new* actions; the water-contact merely enables us to apply it with convenience and with the additional benefit of a warm bath, in the many cases requiring more extensive application than ordinary electrodes permit. The water is simply the medium of making a large and comfortable contact with the surface of the body.

The first striking employment of the electrolytic action of the galvanic current in an electric water-bath was the elimination of lead and other mineral poisons from the body, one pole being out of the water and the other in. This was many years ago. Electrolytic action has more recently been applied to the absorption of selected drugs dissolved in the electric tub bath for the treatment of rheumatic conditions.

For special distribution of current action through the upper and lower extremities, making water contacts without requiring the patient to disrobe, the ingenious "Four Cell" device of Schnee is an important apparatus. It consists of an adjustable seat, four deep miniature porcelain tubs (the "cells") for the immersion of the arms and legs, and a fine switchboard controlling the three main currents for the physician's use. With this apparatus a great variety of conditions can be successfully treated, notably those affecting the joints and extremities.

Another form of bath employs a cabinet instead of a tub. The patient is enclosed in it with the head out. A large electrode makes suitable contact with the upper spine. A foot tub of hot water serves as an electrode for the feet. By means of a special device the cabinet is filled with vapor of the temperature of about 115° F., causing an agreeable action of the sweat glands. While this is going on the selected current of electricity, either galvanic, faradic, or sinusoidal, is directed in proper dosage through the body to set up the tonic, alterative, and other actions needed by the given patient. A labile electrode also permits localization to the chest, abdomen, knees, etc., as may be desired. Experience with such an "electro-thermal" bath cabinet, commencing as long ago as 1893, has amply demonstrated to the author its value in medical practice.

A still further variation of the cabinet is the "Thermo-electric" bath, in which the electricity is generated by opposites of heat and cold. This requires an expensive and bulky apparatus, magnificent for an institution but not well suited to private practice. Yet it is highly praised by those who have it.

It should be remembered that in the use of an apparatus such as a tub or cabinet the active beneficial agent is the *current and dosage of electricity.* Medical judgment and proper technique in carrying out these methods of treatment are required to give them their full value, and the commercial electric bath with a non-medical attendant in charge of the patient should not be accepted as genuine treatment of disease.

Other resources of electricity furnish us with cabinet baths still more ingenious and of wonderful utility. They take us into a new field of interest and we shall describe them after we speak of an older form of appliance which is better known.

The oldest electrical weapon now in the hands of the physician is the Static machine. But it has developed from the crude appliance used by Wesley in his historic London clinics and in the famous clinics of Guy's hospital to a scientific instrument of precision which generates a highly efficient current and is the most versatile and valuable therapeutic apparatus known to modern medicine. It may be said to be an instrument with four *right hands*, and no other single device either in medicine or surgery will enable the master of technique to bestow so many blessings upon patients. Ignorance abuses it lamentably, even yet.

The induction type of machine was invented by Prof. Holtz in 1865 and this underwent a radical improvement in 1885. Thousands of college graduates have seen miniature machines do their toy stunts before classes in physics without obtaining the slightest idea that larger machines, equipped with proper means of treatment and operated by an expert physician, would easily cure consumption, Bright's disease, and diabetes in their early stages and benefit a host of other chronic conditions.

A competent machine of this kind stands about six feet feet high, is about six feet long, about four feet in depth, and weighs some four or five hundred pounds. It is operated by a $\frac{1}{4}$ H. P. electric motor and delivers a perfectly safe medical current of more than a million volts, jumping a spark-gap of twenty inches under favorable conditions.

Under control of skilled hands it can be made to administer the gentlest soothing tonic to a wasted infant (we have treated babies a month old with it), or rouse to vigorous contraction the muscles of a paralytic. It can be made to allay the worst of pains or restore the lost sensations of paræsthesia. It coaxes back the lost sleep of insomnia; it heals all ulcerations of the surface, and is the only definite cure of hay fever known. It efficiently excites an *x*-ray tube for both radiography and treatment. Its "platform" condenser methods cover the widest range of technique of any single apparatus. It has the High-Frequency attachment which duplicates the work of other High-Frequency apparatus. It possesses in its Leyden jar methods the resources of other interrupted currents, mainly the faradic, which in some ways it surpasses. And it excites a compact arc lamp made with special electrodes of peculiar metal which yields an abundance of ultraviolet rays. No other one instrument can be made to do so much.

But to accomplish these things certain competent accessories are needed, as well as an expert operator. The insulating platform must have glass legs a foot long to permit the accumulation of current on it, for the thin stream of direct current will do no work except through a *condenser*. If Leyden-jar condensers are used they must be of proper dimensions and operated with due regard to dose. Electrodes are of the utmost importance and a large variety is needed, for electrodes and their manipulation control the effects.

In their main field of action the High-Frequency coil apparatus and the High-Efficiency Static machine overlap each other, furnishing a choice of means in difficult cases and permitting an important refinement of selection. Both are notable in their power to relieve pain, and in the curative treatment of tuberculosis both constitute invaluable links in the therapeutic chain of the up-to-date physician.

Next, for a moment, let us glance at the "Sinusoidal" device which supplies the practitioner with an apparatus and form of current allied to the faradic but possessing characteristics of its own. Four varieties have been made, each providing a little different quality of current, the chief advantage of which is found in nice adjustment of the dose.

The earlier design supplied an ideal current within a narrow range; exquisite when needed; fine, smooth and most gratifying in local states of great tenderness, pain, congestion, or inflammation. Later modifications have given us currents of more amperage, and one which we have lately had constructed is especially suited to the administration of tonic electric baths of the tub variety. Such baths have been greatly improved in recent years and with competent apparatus they are capable of doing great good. They supplement the cabinet baths of radiant heat and light which we shall consider presently.

But what is the sinusoidal device and current? The medical current of electricity to which the *sine* wave has lent its name is practically an induction-coil current similar to the other induction-coil currents called after the immortal Faraday, but with *all the sharp angles smoothed off* by the mechanical device of the *make* and *break.*

Instead of a spring vibrator to furnish the rapid interruptions they are provided by a break wheel motor which drives the armature. The continuous *primary* exciting current is then transferred into *secondary* alternating-current waves which are "sinusoidal" in their regularity of rise and fall. Tie a long clothes line to a post, hold the other end a little slack and give it one impulse and you will see a *sine* wave of undulations travel along the line. With more slack the wave will be fuller. An electric current of this kind, with suitable accessories for control of dosage, is useful in the treatment of many conditions.

The apparatus so far described give but a partial idea of the splendid resources of the physician outside of his drugs, for they by no means cover all the medical services of electricity. Devices hardly less important in the production of physiological and curative effects in a great range of diseases owe their actions to electric currents and rightly belong to this chapter, for they are linked with electricity as light is linked with the sun. Among them are *vibrators* of various models, size, cost, and therapeutic value.

Vibrators operated by electric motors with regulators of speed, stroke, and action have come into the physician's equipment within a few years. There are many toys offered to the public under the name of vibrators, but the genuinely therapeutic apparatus is a different sort of thing. It ranks high among the physical agencies of modern medicine, and is especially important in its action upon circulation and nutrition. It costs from $75.00 to $200.00.

As the electric motor has wrought an industrial revolution in factories, so it is making possible a variety of aids to office practice that must appeal to every physician who tests them. Ten years ago who expected a motor to *fan human tissues into therapeutic vibrations* and thus furnish the highest type of *scientific massage?* To-day the electrically driven vibrator places the combustion of local tissues under "forced draught" with the body at rest, produces the effects of exhilarating excercise, and by precisely regulated dosage sets muscle fibres at work transforming the applied energy into heat, increased metabolism, and improved physiological functions.

The term "massage" is so well known that it will occur to every one at the mention of passive exercise for the tissues, but ordinary manual massage compares with the resources of a swift, tireless, and flexible motor (with a score of attachments for precise dosage and an enormous range of effects) as a hand-drill compares with an electric drill, or the horse-car system of 1888 with the electric traction of the present. These few words will open the reader's mind to the practical possibilities of new apparatus well suited to office methods and exceedingly agreeable in application.

There are three general classes of these electrically operated machines which deal with the tissues by means of dosable movements:

1. Those which transmit coarse, medium, or fine rapid vibrations through the muscle-tissues and vessels by means of motor-driven impulses upon the surface. Accurate prescribing of the action and dexterity in technique are required to meet the diagnostic indications and produce proper effects.

2. Those which exercise the tissues of a local part *en masse* in a series of oscillations of regulated stroke and speed, for a prescribed time.

3. Those which cover the field of mechanical gymnastics and passive resisted movements.

These supplement sweat baths and hot air, the surgery of joints, and all measures that need *tissue-change* for their completion. To understand the indications for selected *rates of change* in vibratory stimulation or sedation of the tissues of any part of the body physicians simply apply the medical judgment gained by study of the effects of all forms of physical exercises and all passive exercises by resisted movements, including every action of massage. Add to this much of the local work of the induction-coil current as an anti-congestor, sedative, tonic, stimulator of inert muscle fibres and we about cover the range of work adapted to the motor-driven swift substitutes for former slow and inferior methods and hand massage.

Coming to the practitioners' knowledge for the first time the best apparatus in this branch of technics was a surprise, but within a few years they have multiplied in both number and variety and are now well known to both the profession and the public.

We now come to one of the most attractive and satisfactory instruments within its scope of action, which it has so far been our fortune to meet. It is a variation in medico-mechanics, modified and improved by the author, and was named by us the Tissue Oscillator. It is compact, adapted to office practice, simple in technic, and of *self-evident merit.* Theoretical considerations at once become superfluous when the practitioner submits his *own* tissues to the actual experience of treatment. The physiological activities set at work are so apparent that no words are needed to discuss them.

The essentials of the Oscillator are two eccentrics mounted on a standard adjustable to all desired strokes, and made to revolve as slowly or rapidly as required to produce the needed effects. Its action is distinct from either vibration or massage. To be rightly appreciated it must be felt. The work of some drugs must be taken on faith; and it may be open to doubt whether an "absent treatment" by one of our new C. "science" healers will make good, but about the work of this Oscillator there is no doubt whatever. It tells its own story of energetic physiological activity to every

DAVY
(1778-1829)

Principal founder of the science of electro-chemistry. Possessed of a large voltaic battery, he produced the electric arc on a large scale at lectures, thereby greatly enhancing popular interest in electricity.

sense of the patient and leaves no part of its motive to the imagination.

Add to this that it demonstrates a wide range of usefulness in practice, does not require entire removal of clothing, makes no other demand on skill than regulation of the dose, and takes but an average of five or eight minutes for a treatment and the value of the device will appear. In two special fields it is an adjunct of the first class—the chronic constipation of the fat and sedentary, and the accumulation of fat which is called *obesity*.

And now we come to one of the most admirable and efficient of the new contributions of electricity to medicine—the *electric light*, furnishing us with several kinds of medical apparatus which we could not do without in the modern treatment of disease.

When this new source of light took the place of lights that smoked and blazed a revolution in the study of luminiferous radiations quickly developed. The spectrum of an oil lamp was of no consequence, for the flame could not be used. But the spectrum of the arc and incandescent lamp was compared with that of the sun and means of modifying the "electric sun" to yield the physician any part of the composite spectrum for study and for treatment of disease were rapidly investigated. The results have enormously added to the relief of mankind. In Copenhagen the researches and work of Finsen made Denmark for two years the world's centre of medical interest. His four-tube arc lamp apparatus delivered to patients the energy of selected ultra-violet radiations from a 60,000 candle-power source, and seemed at first only less wonderful than Roentgen's radiations of light from a Crookes tube.

The great Finsen apparatus costing about $1,500 and suitable only for a hospital or special institution, stands to-day at the head of medical instruments for the localized application of actinic rays—the rays of light with chemical action and but little heat; but at its antipodes in size, cost, and construction we find the ultra-violet lamp of Piffard and others, compact as a pocket lantern, a little giant in energy, and available for a variety of dermatological work. It is excited by the disruptive spark from either Static machine or $x$-ray coil. The use of special alloys of metal in the electrodes has improved the medical efficiency of this miniature arc lamp.

In France, England, Germany and this country a number of single tube arc lamps using from five to twenty-five amperes of current have been designed for physicians in private practice and the results of the Finsen method can now be obtained anywhere. Finsen died in 1905.

In another field of photo-therapy—the medical term for treatment by radiations of light into the tissues—the physician finds at his command a light apparatus of broader range and different medical action. The aim of treatment with these lamps is to penetrate a given part of the body with intensified rays which are equivalent in potency of action to a tonic sun bath, but which will do the patient more good in half an hour than diffused sunlight can do in a day. The arc, Nernst, and special heavy filament incandescent lamps are all utilized in the construction of medical apparatus of this kind, the intensities of dosage ranging from 500 to 5,000 c. p. Reflectors for parallelism of the rays are necessary in these instruments. It is this type of apparatus which is so admirable an adjunct in the treatment of consumption and all wasting states of debility.

By means of different holding devices the makers of medical apparatus also adapt clusters of special lamps to the local application of healing light rays to particular parts of the body, such as the spine, and the larger joints in rheumatism, gout, etc.

For the general administration of Light-rays to the entire body (as a large number of chronic diseases require) the modern physician commands the efficient aid of *Electric Light Cabinet Baths*—the highest type of eliminating and purifying bath known. It is a beautiful curative device, potential for good to thousands. It is made in considerable variety. For certain effects some of these use two arc-light lamps which pour the rays of 10,000 candle-power through the tissues, riddling them with energizing beams. For other purposes the body is circled with carefully arranged incandescent lamps of sufficient size and number to ensure the radiant heat required.

The newest lamp of this kind in the author's apparatus is tubular in shape, about a foot long, and besides the central carbon it has a return wire outside. This long field of glowing filament backed by a parabolic reflector distributes the luminous rays to the patient much more efficiently than the lamps we read by. Still other cabinets combine both incandescent and arc lamps, and are supplied with screens which enable the physician to filter through them either end of the spectrum he may need, thus affording three qualities of dosage. In one of the author's designs of improved cabinets the intensity is regulated by a rheostat.

The reader who has followed us thus far will have gathered some idea of the splendid resources with which electricity and the leading manufacturers are supplying the up-to-date and scientific physician. It only remains to distribute the knowledge to the entire medical profession and have the public appreciate these newer opportunities of relief and cure. Could these instruments for ~~good be~~ seen by all in actual operation and their results witnessed, the convincing realization of their worth would make this book unnecessary: but those who have not yet seen them cannot derive an adequate mental picture of the brilliant facts from any written account. We shall make plain their ways of influencing health and disease in the chapters that come next, but just here two very important remarks must detain us for a moment.

These "physical" remedies supplement the resources of drugs and join friendly hands with them in the relief of many distressing conditions which routine medicine alone fails to cure. To distinguish their actions from drug actions they are grouped under the head of "physiological remedies," by which is meant that they achieve their benefits to patients by *re-enforcing the natural functions and physiological processes of the cells, nerves, glands, and organs of the body.*

They are esentially Nature's own materia medica, and they accomplish their good solely by aiding Nature. In the various apparatus now employed to administer these agencies we have scientific means of concentrating and localizing the desired action of the given remedy, of intensifying it and adjusting the "dose" to the state of the tissues treated. In all chronic diseases—"*chronic*" simply meaning that the disease is not one which runs a short and "acute" course, but tends to last a long time—the difficulties of prescribing curative drugs are increased by the attendant "complications."

Few chronic ills can be directly removed by drugs, as those who suffer know; and the basic principle of treatment is to assist Nature to conquer the disease by her own powers of recuperation. In the new alliance of physical remedies with the scientific physician and surgeon we possess the most useful means known by which to give this necessary assistance to Nature when the normal powers of the body fail. This is their proper service to the physician and his patients, and a true understanding of the fact will prevent confusion. Electricity is the most rational of remedies.

Finally, it happens many times that a person who is not well asks his or her physician if "electricity will do any good." At this stage of medical progress such a question cannot be well answered by those who have no personal experience in the treatment of patients with a fine equipment of such apparatus as we have described in this and the preceding chapter. If the physician has only prescribed drugs or only performed surgical operations he will not be able to speak from experience regarding the work that a competent expert can do with *additional* tools, of which the non-expert knows little. Always find out if the adviser *knows* before accepting the advice as good. If he does not *know*, then to take his advice is a case of the blind leading the blind.

Unfortunately, good men in medical practice cannot all cover all branches of work, and about branches outside of their own experience many men feel some reluctance to tell patients that they "don't know." But the habit of telling all inquirers that "electricity will do them no good" keeps a great many sufferers from relief, and annually fills thousands of graves with people whose lives would have been prolonged if they had not been slaughtered by the bad advice of ignorance.

This is pitifully true of consumptives. Men, eminent in the ranks of consultants, daily advise patients to go to the mountains or West, and "try outdoor air for a year or so." This is bad advice.

To follow it is merely slow suicide if the patient has passed the incipient stage, and in any case it is *bad advice.* To give it to trusting patients, patients who pay a specialist's fee for good advice, is a fraud on the public and a criminal neglect of the teachings of experience in the decisive treatment of tuberculosis by the measures set forth in this book and a score of modern contributions to the subject of consumption.

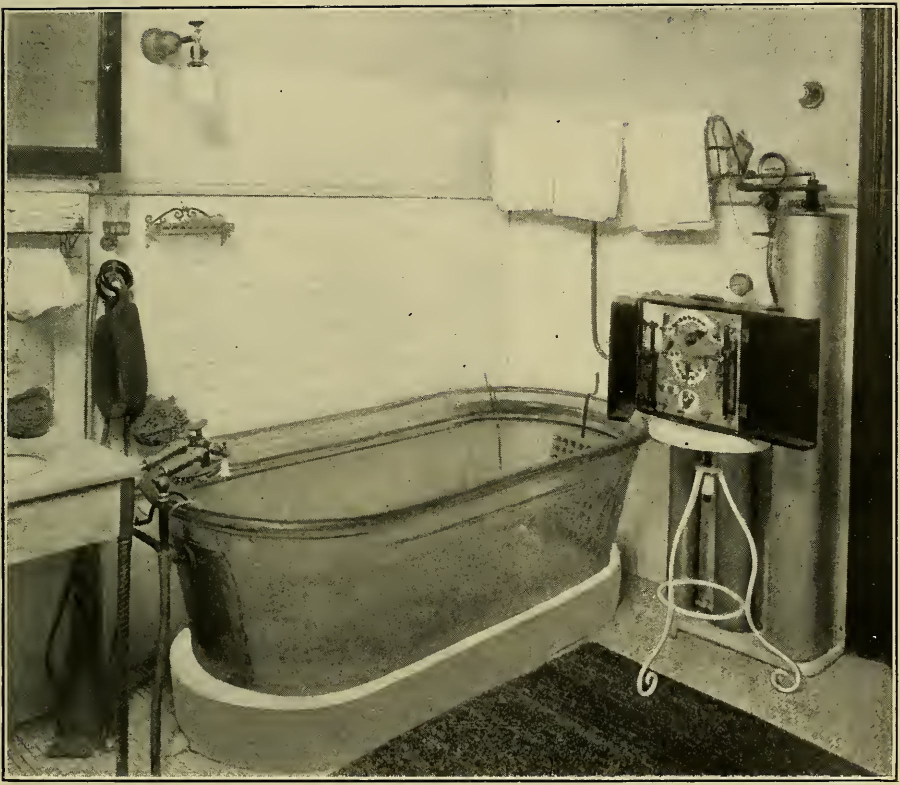
It is our unshakable conviction, based on practical experience, that the essential principles of the outdoor treatment of tuberculosis can be better compressed into the concentrated dosage of half an hour in the well-equipped physician's office. In our former clinical classes we taught physicians the decisive treatment of this disease for years and demonstrated unmistakably the certainty of swift cure in early cases. In our five text-books for the instruction of physicians, methods and results are set forth so that to-day the lingering and pernicious habit of sending patients to distant helplessness should give place to helping them with curative measures at home. The last section of this book should be read by every one.

The next chapter will begin to make clear the influence exerted upon the different structures of the human body by these aids to Nature and to drugs.

# The Actions of Electrical Tools in the Hands of Expert Physicians.

*WITH his hammer a carpenter can drive a nail or pull it out. With his saw he can sever a board in any direction. With his plane he can smooth it. With his adze he can hew chips from a log, and with an auger he can bore one hole or twenty. But none of these tools will set up their actions alone; they will do only what the carpenter knows how to make them do.*

*It is exactly so with electric currents and electrical tools in their uses upon and within human tissues. They will do only what the trained physician learns how to make them do—and the best instruments will do their best work under the guidance of the best hand.*



AN ELECTRIC WATER BATH WITH NAUHEIM DEVICE

This fine imported glass tub is insulated from earth by four inches of hard rubber at the outlet. No metal touches the tub anywhere. The battery shown is the high-tension induction coil apparatus with switchboard and arrangement designed by the author in 1894. Usually he employs a sinusoidal apparatus not shown in this photograph. Behind the battery is seen part of the Nauheim device, which provides the genuine Nauheim bath of the native springs with more than the advantages of the German Spa. It is a great advance over artificial salts and solutions for this form of treatment.

# CHAPTER V.

## WHY ELECTRICITY INFLUENCES HEALTH AND DISEASE.

An Explanation of What Makes Electricity a Curative Remedy, together with an Account of the Present Scope of Electrical Treatment. A Chapter of Information for the Interested Reader.

THIS chapter will answer the score of questions asked by almost every patient who makes the acquaintance of medical electricity in the hands of its master.

"Electro-therapeutics" is the branch of medicine which deals with the application of electric currents to the treatment of sick people—*therapeutics* meaning simply the treatment of disease, as your dictionary will show. It is not a separate system of "cure" but is merely a rational part of the general science of medicine. Electricity takes its place among the familiar resources of physicians and surgeons along with diet, water, hygiene, nursing, fresh air, exercise and rest, as an adjunct to the basic *materia medica* of drugs. It is the true ally and assistant of drugs and not the enemy of any other healing agent whatever.

The modern practitioner is expected to use all means at his command which will benefit his patients. In the complex growth of the healing art one man cannot do everything, hence specialists have developed in communities that can afford them. In large cities they are a necessity. Fine therapeutic apparatus costs many thousands of dollars more than a lead pencil and prescription blank, hence specialists have an elastic professional fee.

The effects of electricity within the human tissues depend on what the doctor knows how to *make it do*. It is the docile creature of *technique*, of special *skill*, of selected dosage, of controlling apparatus, added to a knowledge of disease. Not every family physician knows how to prescribe the effective methods of treatment with the different resources of electricity—they are too numerous and difficult of technic, besides requiring an office equipment which costs a great deal of money. But on the other hand, the competent physician who makes use of electric currents must first have been a trained family practitioner, skilled in diagnosis and in all the art of medical prescribing. Then, to this full knowledge of medicine he *adds* the special knowledge of electricity which enables him to use it.

That is all the difference there is between physicians who are sometimes called electro-therapeutists and those who are called medical practitioners. But those who prescribe both electric currents and drugs desire no title save that of physician. The whole profession is their forum: electricity is simply their *forte.* But it is the world's remedy and barred to none. Every physician ought to seek its aid when his patients need it and every medical college ought to teach its uses.

The physician whose practice is busy with house-to-house calls cannot make much use of physical remedies which require non-portable apparatus and technical training. The specialists in the narrow branches of practice such as the eye and ear, the nose and throat, genito-urinary diseases, etc., will generally use a narrow and small variety of apparatus adapted exclusively to the work they do. In some other narrow specialties, such as nervous diseases and diseases of women, the services of electricity and its physiological resources could be made of exceedingly great value, but unfortunately for their patients the teachings of surgery or tradition dominate these specialties and modern methods have made little progress where they should be most welcomed. The treatment of women and nervous conditions without physico-therapy is an equal injustice to patients whose tissues are fairly clamoring for the curative actions of electricity. Scarcely any "neurologists" of note are competent in electrical technics and few or none have a complete equipment.

In general practice in acute diseases—those which run a short course of fever, inflammation, or functional disturbance—with the patient confined to the house or bed, electricity is little used, for two reasons: First, these are the conditions which tend to natural recovery and in them lies the chief field of medicinal prescribing and nursing. Second, fine apparatus is seldom portable and physical remedies are not convenient to take to the bedside, nor are they very much needed in the majority of acute diseases.

But in general medical practice which deals mainly with *chronic* diseases—all varieties of long-lasting conditions and their subacute complications—we have a whole army of patients who call at their physician's office for the treatment they need. In this extensive field of practice, is found the enormous range of indications for the great resources of electro-physiological therapy. By the word *indications*, so frequently met in medical writings, the physician simply means that the diagnosis *indicates* what remedy is needed; that is, it points out what to prescribe to benefit the patient.

Chronic diseases are much more difficult to benefit with drugs than acute diseases are. A patient may have two, three, four (or even more) complicating conditions involved with the main cause of suffering, and it is often impossible to apply drug action to them all. But the actions of *physiological* remedies can be applied to every complication of the disease without any conflict of effects and with no confusion of results.

The word "physiological" as used in connection with these curative agents is intended to signify that they exert their beneficial actions *in harmony with the natural functions of the body* and tend to regulate them to *normal* when they deviate from it. By proper direction of dosage and technique they can be made to do almost exactly the things that *Nature would do* to drive the disease out of the body, and in this way it is possible for us to bring efficient aid to Nature in her distress and to add whatever power she may lack to restore improved health to the patient, or at least to relieve suffering.

Now, to comprehend what makes "electricity" a curative remedy lay aside all preconceived ideas derived from the worthless "family faradic battery" and all prejudices which may have sprung from advertisements of electric belts, electric insoles, electric hair brushes, and similar commercial devices which do not enter into the ken of the scientific physician. Consider that what we here say is justified only by expensive and finely constructed apparatus which gives us the means of exact dosage and of producing every gradation of action in the tissues that the state of disease calls for. Without competent tools the best workman will fail.

This granted, we are prepared to proceed with a new patient and see *why* electricity is a remedy of the first rank. The physician examines the patient, obtains the history, and not only makes the formal diagnosis but takes into account the entire condition of the patient as well as the kind of disease.

This done, the next thing to consider is *treatment.* Must treatment act constitutionally or locally? The answer to this question is sought in the cause of the disease, and if it cannot be removed by local measure the treatment must be made to act on the entire system. But how?

The physician with the patient before him and his diagnosis done has a mental picture of the state of the different organs, the nervous system, the action of the heart, the quality of the blood, and the operation of the bodily functions. The various causes of the given disease bear on the picture in his mind, and to relieve or cure he must abate or remove the underlying cause. The question is, "By what physiological processes would *Nature*, acting through the organs and functions of the patient, do this?" Study of histology and pathology has given us a very fair understanding of the ways in which Nature works in combating her enemies and conquering disease, and with this understanding as a basis it next remains to imitate her actions until she is enabled to regain her lost powers, or to help her weakness until her strength returns.

Every one knows that electricity unaided by mechanical devices and a guiding hand will not run a trolley car or light a building; and it will not imitate the functions of the organs of the human body without control and a guiding intelligence. But by ingenious variations in the actions which we can make electricity set up we can practically do for many of the inner organs what splints and a pair of crutches do for a broken leg, or what a cork leg does for a man who has lost a good one.

For instance, by one method of local application we can increase the supply of good blood in the part and improve its nutrition by thus feeding it. By an opposite method we can lessen the blood supply of local tissues and thus reduce a congestion and remove its pain. By one method we can produce gentle or energetic contractions of muscle-fibres and thus stimulate them to greater strength; by another method we can reduce irregular and spasmodic contractions and thus relieve cramps and nervous irritation. By one method we can increase the amount of secretion of a gland and stimulate it when it falls below the normal; by another method we can lessen secretion when it is excessive, as we dry up a fluent coryza with a sedative electric spray. By certain methods we arouse the lost sensation of paralytic sensory nerves so as to remove numbness and tingling; by other methods we can allay almost every variety of irritable nervousness and soothe all functional nerve pains.

And if the general system requires an invigorating tonic action we have a choice of methods by which we can exactly suit the given case. The great tonics of Nature are fresh air, sunlight, exercise, baths, and a healthy appetite for good food. The physiological resources of electrically operated apparatus enable us to make these tonic influences more *active and more decisively* beneficial than they are in the *diffused* state of nature.

By means of a special device we can fill the lungs with ozone; by another we can energize the muscles with the most tonic exercise; by still another method we can so act upon nutrition that the tissues are hungry for food, and when they get it they digest it better; the author's "Sunlight" lamp brings concentrated light energy into the physician's office in a dosage that will feed the tissues better in half an hour than the average outdoor sun bath in a day; and no other form of bath approaches in alterative tonic value the various tub and cabinet baths of electrical energies.

Furthermore, as a bent spring, released from a restraining hand, flies upward, so we can release the heart, lungs, and vital organs of the body from the depressing weight of stored-up poisons in the blood, and immediately the relief is felt in an increased sense of well-being throughout the entire system. This is an indirect tonic action, often called for in the treatment of chronic diseases, and we have only to employ the resources of electrically operated apparatus in the right way to set up the most active elimination of waste products and irritant poisons and by this efficient means accomplish the "purification" of the blood.

*These things are readily done*, and the different kinds of work which we can cause electric currents to perform, by setting them in motion in different quantities and different rates under different conditions and with the aid of different mechanical helps and technics, have their analogies in the use of water—floating a navy in a broad harbor, driving, in a forceful torrent, the wheels of mills, descending in gentle showers upon a growing crop, putting out a fire, quenching thirst, and abundantly serving the commercial, domestic, and medical purposes of mankind in mechanical modifications of liquid, ice, and steam.

Before any physician can treat disease with electric currents he must know how to make each variation of each current produce the exact effects that the tissues of each patient need. This is an axiom to which there is no exception.

The *time* required for treatment by the chief resources of physical therapy varies according to the difficulty of setting up the necessary action in the tissues. Some conditions permit this to be done almost instantly—we have seen an intense supra-orbital neuralgia disappear in ninety seconds. Some conditions yield only after ten or fifteen minutes. Some require treatment for half an hour. With certain baths the time allowed for disrobing, for the bath, and for the "after-treatment" is about an hour. The nature of the action which is required to relieve or cure is a factor in dosage. When *intense* action is indicated the time is usually short; when slower and more gradual effects are called for the time is necessarily longer.

"*Stimulation*"—and electricity can be made the greatest of all stimulants—is generally a quick process, for over-stimulation is not desired, any more than we wish a patient to work himself into exhaustive fatigue when we recommend exercise. Therefore the application of electricity by special methods for the particular purpose of either local or general stimulation involves short sittings of a few moments. These actions of electric currents are deeper, longer-lasting and more beneficial than the stimulation of any drugs or drinks. They are not followed by a reaction as is alcohol; they create no "habit" like liquor; they are wholly beneficial without any drawback whatever.

"*Counter-irritating*" applications — and the resources of electricity provide the greatest of medical counter-irritants—are regulated as to time by the same principle and are very short. Mustard, capsicum, and other stimulating plasters are the familiar reliance of the laity when a lame back calls for a "counter-irritant" to ease pain. Iodine is the greatest of drug-agents for special alterative-irritant effects. But electrical counter-irritation can be made far more efficient than all other agents of this kind put together. A turpentine stupe is a familiar counter-irritant application to the chest in the tight stage of bronchitis, but turpentine compares with electricity as a dime does with a dollar.

General *tonic* applications of electric currents involve slower-acting effects and take more time. Fifteen to twenty minutes may be allowed for this purpose.

*Sedation* involves an opposite principle and still slower methods in severe cases. Yet local circulatory sedation and the soothing of nerves is often as quickly accomplished as local stimulation. In difficult cases a longer time is a safe allowance, for we cannot over-soothe, over-rest, over-refresh, and vitalize an exhausted nervous system—and electricity supplies the physician with a variety of resources which soothe and sustain the nerves better than any "drug sedatives" known.

Its tranquillizing and refreshing properties are indispensable in the treatment of *neurasthenia*—an irritant debility so common that press writers call it "Americanitis," and when it reaches its acute stage the public calls it "nervous prostration." A month or two of electricity will do more for these cases than a year or two of "rest" and medicine.

Without doubt the two greatest medical properties of electricity are its control of *pain* and its remarkable power to improve nutrition. In these respects it is unique and unrivalled, and if it could be carried in the pocket and self-administered, morphine and the bitter tonics would cease to spur a lost appetite. Nutrition is the foundation of health, and the deep acting properties of electricity in proper dosage and technic not only release the normal appetite from the depression of influences which impair it, but increase the ability of the system to digest and absorb food.

*Frequency* of treatment and the *amount* of treatment that a given patient may need are two questions calling for answer. Two axioms apply to the whole science of medicine: "acute diseases require acute treatment; chronic diseases require chronic treatment." By this is meant that diseases running a brief and rapid course require a frequent repetition of the dose in order to secure and maintain the effects, while in chronic diseases which make slow progress the effects must be slowly developed, and in order to allow them to develop from a given dose the next dose must follow at a longer interval.

The action of electricity lasts much longer than that of drug remedies and hence in acute conditions when a drug would be given every hour, electricity is usually administered once or possibly twice a day. Cases occur which could be more rapidly benefited by three or four treatments a day, but in office practice such patients are generally treated once with electricity and an adjunct prescription of the indicated drug is given to relieve the patient from the tax of more frequent calls.

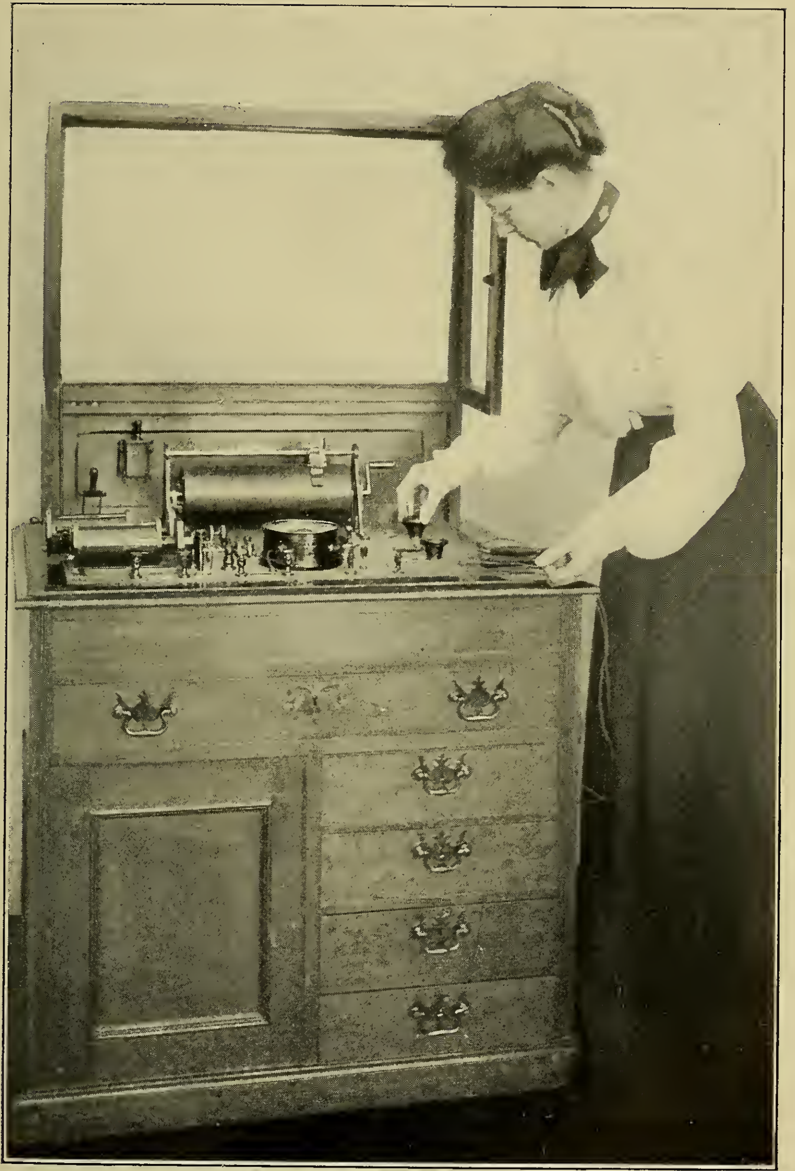
In the majority of chronic diseases the rule is at first, three treatments a week, varied, in cases of acute suffering, by a daily treatment until the worst of the suffering is controlled. When the relief lasts long enough to make two treatments a week suffice the frequency is reduced accordingly, and finally one treatment a week will bring the improvement to a finish.

In many chronic diseases the controlling factor in the amount of treatment required is not the severity of the symptoms so much as the length of time since the disease began. The boy with his sled will remember that the longer the ride down hill, the longer the walk up. And the same philosophy follows us through life. A disease that has lasted twenty years is not likely to find a cure in a week.

On the other hand it must be recognized that the curative actions of the physical agencies used in medicine will often accomplish their results much more rapidly than drug agencies and unaided nature. Most of the skilled work done with electric currents is done in three months, even in conditions which have been treated by drugs, rest, climate, etc., for years with little benefit. Many conditions obtain long-lasting relief from half a dozen treatments.

When we consider the inveteracy of some conditions under routine methods of treatment the action of rightly directed electricity may seem "magical" to those who are not taught the physiology of curative actions. But there is nothing singular about the facts. They are as rational as sunlight. Three samples will suffice to explain how simple the "magic" is.

Take a case of acute lumbago, for instance: Liniments, plasters, and rheumatic remedies are likely to disappoint. But by "milking" out the congestion in the small blood-vessels traversing the muscle-fibres of the part we remove the stasis and flush the tissues with fresh circulation of normal blood. By forcing the stiffened muscle-fibres to contract and relax in turn we restore their power to contract normally. By the combined influence of these two actions the nerve filaments of the part are released from pressure and restraint, and they cease to hurt. We set up these actions by the special use of a proper dosage and technique



A COMBINATION STREET CURRENT ADAPTER FOR MEDICAL USES

This picture illustrates one of the advances upon the familiar and primitive faradic battery, still sold to the laity but discarded by all physicians competent to treat patients. This apparatus furnishes faradic, galvanic, sinusoidal, cautery, and endoscopic currents, all under exact control of dosage. With this type of apparatus a variety of several hundred electrodes enables the physician to do a wide range of work.

with a choice of four electrical resources, using those which experience indicates will give the best relief.

If the lumbago was caused yesterday by exposure to a draught a single treatment of five minutes is often an immediate and complete cure. If it has lasted a week or two it will usually be cured by three to six treatments and stay cured until a new exposure brings on a new attack. If it has lasted for many years it will take a month or more to obtain the maximum of relief and when relapses occur it must be treated again. In contrast with the benefits of other remedies we see that the action of electricity is far superior, but its superiority is logical and reasonable.

Take the case of Hay fever, one of the diseases seldom cured by routine drug agencies or the White mountains. Electricity will cure it very quickly, and at any time of the year. The explanation is this: The patient is "neurotic" and susceptible to disturbances of the nervous system. There is a local irritability of the nasal mucous membrane. The irritant pollen which excites the acute attack of hay fever inflames the susceptible mucous membrane and causes the disturbing and annoying symptoms. When we cure it with electricity we simply have before us the task of healing the "sore spot" in the nose so that it will not inflame any more under the general conditions of breathing the air of any place where ordinary people live. At the same time we reduce the general nervousness and improve the nerve-tone. Then pollens may blow at will and the annual seasons will pass with no more hay fever.

The benefit afforded by electricity is often indirect, but nevertheless as sure a relief to the patient as an incision to a boil. Varicose veins of the leg are a painful example. How does electricity cure them? It does not "cure" varicose veins at all, nor does anything else; but by the aid of electric currents we take off the elastic stocking, restore the use and sensation of the leg to normal, and the patient forgets that his veins are varicose and he uses his leg like a well man. The pains and heaviness drop from him and seldom return. If they do, simply repeat the treatment as needed.

The explanation is not difficult. A "varicose" vein is a long vein with its walls so enfeebled that it will not hold up the weight of the blood in an even column but lets it sag in places. These places swell out and make a pocket in the vein in which stagnant blood lingers and the pressure of the weight makes the leg feel heavy and often painful. Exercise becomes painful and the less exercise the patient takes the more his muscles lose strength. After a time tissue-alterations develop and a pathological state exists.

The routine prescription is an elastic stocking to support the dilated veins. But the remedy aggravates the disease and annoys the patient, as all who wear a long rubber stocking through a hot summer can testify. Liniments do no good and the surgical ligation of the veins is a preposterous procedure. The certain and almost instantaneous relief can be found in electricity. How?

Have the patient take off the splint-like stocking that binds the free action of the tissues. Let him carry it home in his pocket and fire it in a drawer, never to wear it again. A man who has been wearing one for fifteen years may think he cannot get along without it but he is mistaken. Select an electric current which will act through his clothing and not necessitate the removal of any. Use a technic which will produce a vigorous series of muscular *tonic* contractions and not only restore the impaired elasticity of the fibres to nearly normal strength but which will drive along the stagnant column of blood and enforce an *evenly distributed circulation.*

This does not directly "cure" the condition but it removes the disturbing factor in the condition, and strengthens the muscle-fibres so that they hold up the veins in far better tonicity. When the first treatment is followed by a second and a third the leg will forget that it ever had to wear a rubber stocking. If the dilatation has been moderate a few treatments will suffice for a long time. If it has been more severe it will take a regular course of treatment about twice a week to fix the improvement so it is fairly permanent. If the tissues have broken down and ulcerated we heal them with the same current applied in a different way. It is beautiful work, and grateful to such patients, and if widely known, elastic stockings would cease to be manufactured for they are a very bad form of treatment.

Some of the actions of electricity can be set up in the tissues through all or part of the clothing, and this is a great convenience in office practice. Other actions require direct application through the bare skin. Some local lesions require a very exact localization of the electrodes in order to impart relief, and some conditions benefit by a more diffused application.

The physician who makes much use of fine electrical apparatus is governed by three cardinal rules of great importance: *Never hurt a patient; never alarm a patient; never startle or shock a patient.* These rules are fundamental.

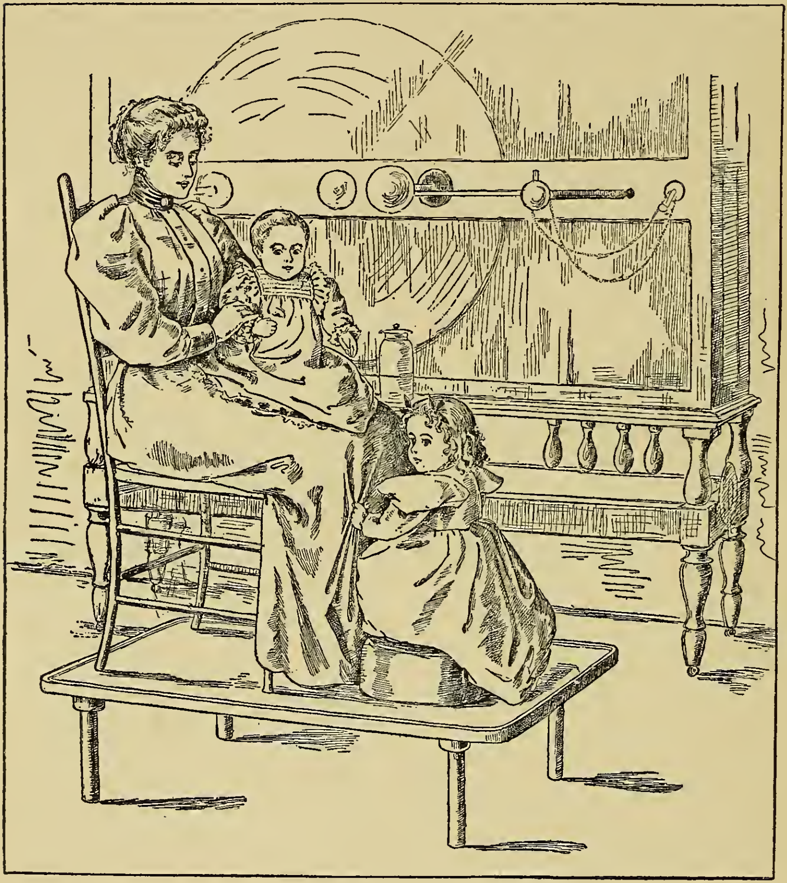
We employ electricity to remove pain and not to cause it. To fear treatment which will do so much good is as foolish as to fear ghosts; for there is no ground for alarm, and to manufacture it out of the imagination reminds us of a horse, frightened at a pan of oats. Physicians using electrical apparatus in such ways as to torment patients betray their ignorance of correct methods and should be avoided. To *hurt* patients is evidence of want of knowledge and skill.

One of the familiar and pleasing sights in the author's clinic some seasons ago, with a class of physicians in attendance, was a young mother seated comfortably on an insulating platform and holding in her lap an infant of five months, while, seated on a hassock at her feet and resting contentedly against her mother's knee was a second curly-headed tot of twenty-seven months.

The mother was subject to constant headaches, the oldest child had marasmus, and the youngest was almost as small at five months as when first born. Under the gentle persuasion of tonic electricity all three members of the family improved to a marked degree. In this case no clothing was removed, no discomfort of any kind was caused, and the treatment of all three patients at once took only about fifteen minutes. This illustrates one phase of the resources contained in high-efficiency electrical apparatus.

But that electricity *can* hurt is undeniable. The use of a coarse current will hurt an irritable spine, but no expert would use a coarse current. He would soothe the spine and allay the irritation with a fine sedative current. The sensations aroused by the different methods and doses of electric currents depend very much on the condition within the tissues, and are not the direct sensation of the current. For instance, a patient has an attack of painful "piles." We place her on the table and insert a suitable electrode. The mere touch of an intruding body—the gentle electrode—hurts the tender tissues, but in a moment the soothing current from a proper apparatus eases the pain and in five minutes the relief is great. After a few treatments the comfort remains for a long time. It was not the current which hurt; it was the state of the tissues.

Take another case: a uterus is inflamed; the fundus is sore to the touch; it is painful as a boil; we apply against the tender body of the organ a suitable electrode and gently coax the dosage of current into action. The patient will not say the electricity hurts, for she knows that the hurt is in the tissues themselves and in a few moments they hurt less and before ten minutes have



A FAMILY GROUP.

This picture illustrates the narrative in Chapter V. The drawing has a history of great interest. The original was drawn in 1898 in the author's office by another patient, who was convalescing from an attack of acute insanity. She owes her recovery to electricity. She is still well and supporting herself by her art work. The group is a faithful reproduction of a very familiar scene.

passed she leaves the table devoid of pain. The current has removed it.

Some forms of physiological treatment produce no sensation that the patient can feel. Some are exceedingly agreeable—almost luxurious in their gentle impressions upon the nervous system. A counter-irritant application may smart for thirty seconds but its effects immediately "feel good." Vibration is pleasant. Light rays should set up no action save beneficial comfort. High-Frequency currents are a delight in skilful hands. The Static machine is often abused but it yields some of the greatest benefits with the most grateful feelings within the experience of patients anywhere. In most of the electrical treatment of the pelvic diseases of women, a field of work in which electricity is the Balm of Gilead, the patient feels nothing, for the uterine tissues have few sensory nerves of the ordinary kind.

In the whole range of electro-therapeutics the patient has much to be thankful for and *exceedingly little* to complain of. And if fault there be look to the operator rather than to the agent.

# CHAPTER VI.

## THE CURATIVE ACTIONS OF ELECTRICITY IN MEDICAL DOSAGE.

The Medicinal Properties of the Three Fundamental Currents and How They Compare with Other Remedies. Particular Information for Those who Wish to Understand This Important Subject.

In our previous chapters we have seen that mechanical devices give us many variations of electric currents and that methods of technique are the means by which we make these currents produce a great variety of effects. Before showing what diseases we may cause the actions of electricity to benefit, let us first see just what the medical actions of each current are.

In the author's technical books for physicians the so-called "physiological actions" of the different currents and methods of administration are set forth at length. Here, for lack of space, they must be condensed into a brief but suggestive synopsis, yet sufficient to inform the reader and make clear the foundation reasons *why* electricity can be used to cover the range of one hundred leading drugs.

But first discard the crude idea that "shocks" have the slightest relation to the medicinal actions of electricity. A head-on collision between two trains is not proper railroading, and shocks are not *treatment.* In 1777 an investigator of medical electricity wrote as follows:

"(Dr.) Lovett, who practised medical electricity for a long time, was, so far as I know, the first to protest against the use of strong shocks. . . . A long series of experiments and observations have proved shocks to be generally useless or hurtful."

A method that was proved to be folly as long ago as 1777 ought to be forgotten now in this twentieth century. But press reports of electrocutions and the "electric chair" revive the word and like Banquo's ghost it will not go out of business. Silly minds appear to like feeble jokes, and although a "shock" is practically impossible to produce with the refined dosage of scientific medical apparatus, it is the custom of some who have never been near enough to a fine battery to touch it, to simper out some frivolous imaginings on shocks whenever the subject of treatment by any electric current is mentioned. The babe in the cradle is no more shocked than is the patient in the skilled physician's office. *Forget* the word.

Now, as to *physiological actions* which technique and special dosage can induce electric energies to set up in *living tissues:* The great current of Galvani in its constant form—generated by proper primary cells and controlled by complete devices on the switchboard—possesses complex polar and inter-polar properties which are generally grouped under four heads,—cataphoric, electrolytic, nutritional, and electro-tonic. These conventional terms merely represent various sides of the *influence of different tissues* upon the nature of the actions which they will permit. A metallic conductor has but one substance in it, but the human body has several kinds of substances in it and they are able to act only according to their nature. A bone will not contract like a muscle, a nerve will not flow like blood, the actions of the liver, kidneys, and heart are different; and the nature of the tissues acted on directs the nature of the electrical actions we can induce.

When the semi-solid substance of muscle or the fluid constituents of the body are subjected to the inter-polar action of a constant galvanic current of sufficient strength, there is an osmotic and cataphoric determination of the products of *electrolytic* action from the positive electrode toward the negative electrode. This osmosis produces physiological effects which are fluid-lessening, anti-congestive and denutritive at the positive pole, and fluid-increasing and congestive at the negative pole, with ordinary protected electrodes and mild dosage. The lessening of the capillary fulness at the positive electrode will also be sedative in congested conditions and their accompanying pains, and the increased capillary blood-supply at the negative region will be locally nourishing, stimulating, derivative, and alterative in the opposite pathological states.

The *nutritional* actions of the galvanic current result from its stimulation of the processes of nature. With the interrupted current this is secondary to tonic contractions of nerves, cells, blood-vessels, etc., ramifying in the muscle masses which are directly acted on. But with the continuous current the nutritional influence is the complex entirety of the so-called dynamic properties of relatively large amperage and low voltage.

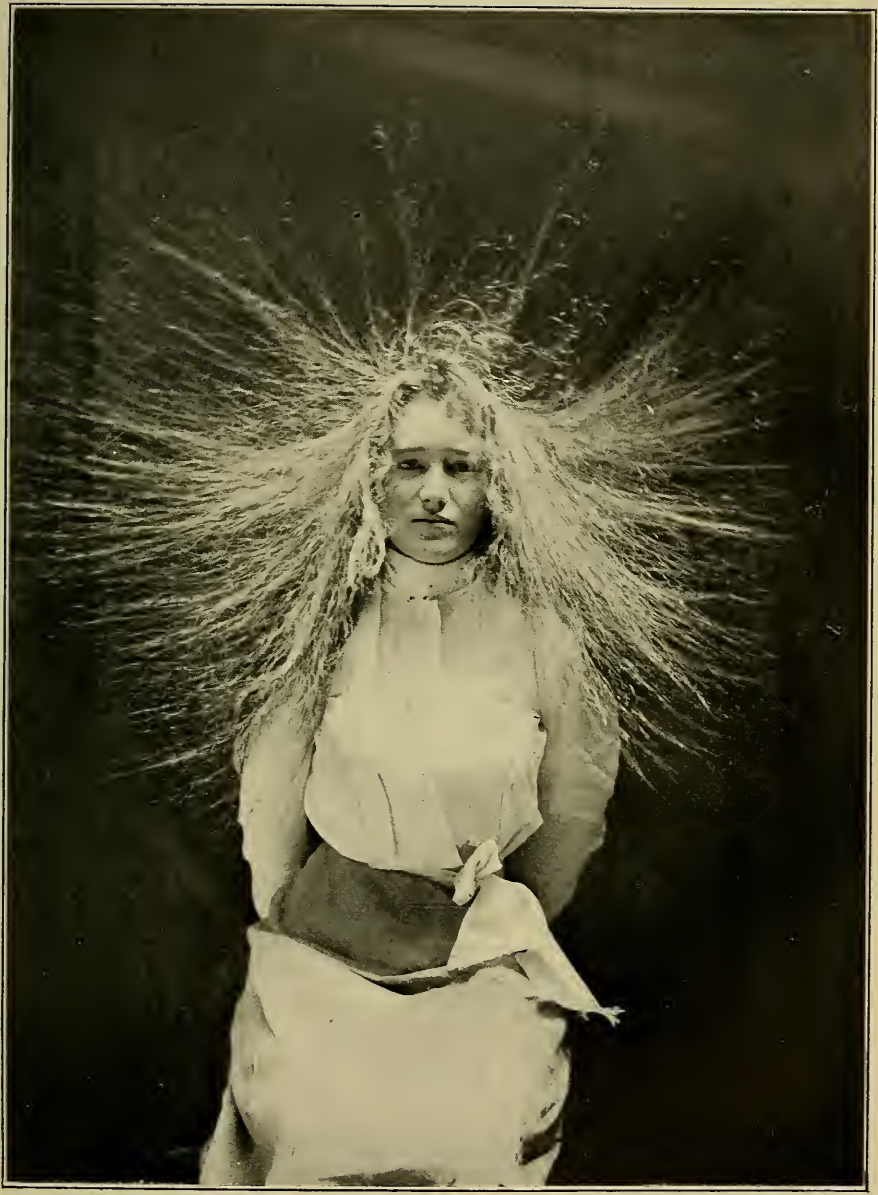
When applied for the purpose of promoting nutrition in diseased states of the body the constant galvanic current dilates the blood-vessels and lymphatics and this increases the powers of absorption of the tissues, promotes osmosis and feeds and strengthens the muscles. Added to these effects is an influence upon molecular exchange in the processes of metabolism due to exciting or soothing the nerves themselves or the parts which they supply. Certain changes in the molecular arrangement of vital structures and in the nutritive activity of secreting and excreting cells takes place at the same time. In emaciation and in nervous debilities the nutritional benefits of the galvanic current are of inestimable value.

*Electrolysis* is the breaking up of chemical compounds into their separate constituents, but in medical practice this is not carried out as in salts and metals. The process is carried just far enough to alter the nutritive state of morbid tissues and stimulate them to *heal;* and the negative pole of the galvanic current will heal an ulcerated and eroded *os uteri* quicker than any other resource of modern medicine.

Acting within the human body, which is an electrolyte of far more complex conductivities than the electrical engineer has to deal with, the positive galvanic pole liberates oxygen and chlorine and attracts the sulphuric, nitric, hydrochloric, and phosphoric *acids* from the decomposed fluids and has a drying action in the treatment of soft, spongy, infiltrated, and bleeding states of tissues —notably the uterus. The degree of intensity of action is readily controlled by the dosage—which is regulated according to the needs of the tissues treated.

The negative pole, on the contrary, liberates hydrogen and collects the *alkalies* of the fluids of the body—sodium, potash, lime, ammonia—and hence has a softening action upon indurated tissues. The negative pole therefore increases the capillary circulation, increases the functional activity of a nerve, softens and dissolves small tumors, exudates, contractured muscles, and promotes the absorption of infiltrations.

Attention is often called to the differing effects of large and small doses of many drugs, but equally as great contrast is presented by the different effects of the constant galvanic current in doses ranging from one milliampere up to two hundred and fifty. Add to this the influence upon effects of many different electrodes and



THE LAW OF ELECTRICAL ATTRACTION AND REPULSION

In electrically charged bodies opposite poles attract; like poles repel. This law, discovered three hundred years ago, is beautifully demonstrated in this exquisite photograph. Compare the energy at work in the tissues of this patient (and without sensation) with the result of an attempt to produce this effect with a "family battery." This young lady stands on a static platform and is charged by a static current, the tonic action upon the inner cells, nerves and functions being expressed by the intensity of the "repulsion" shown by the hair, which was let down for the purpose of illustrating the above law.

methods of administration and we can comprehend that one current can be made to treat many people, as one central station can operate many industries.

The action of this chemical current with special electrodes of many metals, which it decomposes and re-forms into nascent drugs, (oxy-chlorides of copper, zinc, silver, iron, etc.) and by the cataphoric action of the positive pole drives into local tissues, tumors, etc., imparts to its local polar effects a diversity of character which few of the public suspect. For some purposes the selected metal used in the electrodes is left bare. For others it is covered with various substances such as sponge, felt, absorbent cotton, sculptor's clay, etc. These must be wet with a solution of sodium bicarbonate before they are applied to the skin, for the resistance of the skin must be reduced to the lowest possible point in order to secure the best effects.

Among metals employed for electrodes without covering are copper, silver, zinc, brass, steel, carbon, mercury, lead, aluminum, tin, platinum, and gold. Electrodes are made in great variety of sizes and shapes, and adapted, like the surgeon's instruments, to the special needs of every part of the anatomy—eye, nose, throat, skin, spine, urethra, rectum, uterus, vagina, hair follicles, tumors, etc. And on the proper contact of the proper electrode, and the manipulation of it, depends a great part of the efficiency of the galvanic current—the dosage, time, and frequency of treatment doing the rest. To the multitude of these mechanical devices is due the wide scope of action of this great chemical current, for through them it is concentrated or diffused, made direct or indirect, local or constitutional, as is required to meet the indications of the diagnosis in each patient.

The *cataphoric* action of the continuous current is also made to drive such potent drugs as mercury, lithia, cuprum, arsenic, iodine, cocaine, belladonna, and any other soluble medicine, directly into localized tissues. The action is then limited to the direct tissues without the systemic disturbance of large doses by the stomach.

The whole of this subject cannot be put into words, but must be seen and felt to be fully understood and appreciated. There is no guesswork about these things. They have been subjected to the severest tests and have been confirmed by investigators in every year since Remak and Richardson. Methods of investigation are more exact than with drugs for the obvious reason that electric currents can be localized with great facility and their actions studied in visible ways that are not possible with the majority of drugs, and to-day scarcely any important drug in the pharmacopœia is so well explored and charted as electricity. But here we leave this current to take up the next. Not all its story has been told, for therapeutic actions which can easily be demonstrated are difficult to describe, and like harmonious sounds or shades of color they merge into the indefinite where language cannot follow them.

It is difficult to deal exactly with the physiological effects which we may cause *induction* currents to set up in the tissues because the variations in grades of action shift with kaleidoscopic swiftness with every change in the devices through which the current is passed on its way from the primary cell to the patient. Nearly the whole influence of induction-coil currents within living tissues results from their *contracting effects upon muscular fibres.* Secondary results of great benefit flow indirectly from their primary actions, as increased crops grow upon irrigated land.

By selected control of the factors of E. M. F., Quantity of current, Resistance, Rate and quality of Interruption, character and contact of Electrode, and dexterity of Technique, we can cause the administration of a wide range of dosage of Faradic currents—equal to a score of drugs in variety;—and can compel one dosage to soothe, another to stimulate, another to produce intermittent muscular contractions, another to maintain a physiological tetanus.

We can make this form of medical electricity allay many kinds of pain—and it is worthy of remark that every known form of medical electricity has an almost miraculous power to relieve pain and comfort suffering.

With fine induction currents we can combat congestion and acute localized inflammations, can reduce hyperplasia, relieve a sprain and contusion, increase wasted or non-developed muscular structure, tranquillize the nervous and circulatory systems, increase peristalsis of the intestinal tract, relieve constipation, promote nutrition and hasten absorption. There are many arrows in the full quiver of this instrument.

Considered in their entire range of action the induction currents obtained from a scientific modern apparatus unite upon nutrition in human tissues the good effects of exercise, warmth, increased blood supply, and fine vibratory massage. They are circulatory, muscular and nerve stimulants, tonics or sedatives—according to the manipulation of the physician who controls them.

These currents contract the walls of blood-vessels as well as muscles, increase peristalsis—the action of the bowels—in all non-striated muscular fibres, stimulate every part of a nerve from the cell to the terminal filament, excite nerves of special sense, quicken the circulation and glandular secretion, combat blood stasis, relieve congestion in any local part, and promote the re-absorption of effusions and the elimination of products of waste.

The processes of oxidation are quickened, the elimination of urea, carbonic acid and water is increased, and imperfect digestion of food is more perfectly carried on.

For many years the sole employment of coarse stimulating currents was upon the surface of the body. The finer sedative currents now obtained from high-efficiency induction apparatus invade the pelvis and produce effects which call for special remark. They are as interesting and valuable as any within the scope of electro-therapeutics, and no physician in either general or special practice who has women for his patients can afford to remain uninformed on this portion of the subject.

Upon the skin, supplied as it is with sensory nerves and offering some resistance to the current, the polar actions of induction currents are chiefly manifest near the electrodes, or the current passes between them without much lateral diffusion. In the soft moist cavity of the pelvis, however, the conditions are radically different and are singularly fitted to wide diffusion of the current and to painless tolerance and utilization of doses that are far beyond the tolerance of the sensitive skin. The mucous tissues are wellnigh as good a conductor of these currents as a salt solution; they are circumscribed by a boundary which is a bad conductor, and within the cavity, the diffusion of current by the bi-polar method, reaches every tissue, the ovaries and uterus, and immediate ramification of nerves and vessels.

This high conductivity, low resistance, and compact relation of the pelvic organs creates possibilities for the bi-polar method of faradization that do not exist elsewhere in the human body. The credit of the happy and manifold effects of this method in peri-uterine disease is due as much to these favoring conditions as to the inherent properties of the current used.

The first marked effect is the relief of tenderness and pain if these exist. Treatment can be made either sedative, anti-spasmodic, and anti-congestive; or tonic, stimulating, and muscle contracting. If it is made stimulating it quickens the capillary circulation in the parts, contracts the small arteries, augments the blood pressure and disperses nervous engorgement. The powerful and agreeable current stimulates the contraction of all intra-pelvic muscular fibres and the absorptive processes of lymphatics, relieves local congestion, and accomplishes rapid absorption of recent infiltrations and exudates. It is the most powerful, certain, and therapeutically valuable vaso-motor constrictor we possess.

The *sedative* action of these currents applied so as to produce local sensory anæsthesia and recuperative rest, is incomparable with any other medicinal agent. For the relief of pelvic pain and congestion, and pelvic inflammations and their results, infiltrations and exudates, vaginal bi-polar faradization acts not only as a remedy for the symptoms but with distinctly curative results.

As an auxiliary to other currents and measures beyond its direct capabilities it performs a service of extraordinary value in many cases. It serves an exceedingly useful purpose preparatory to surgical operations by its tonic action upon the local tissues and by improving general nutrition. The disappointment so frequently the lot of patients who have submitted to an operation only to find their pains unrelieved may be often removed by subsequent applications of some form of electrical treatment in expert hands.

Sedation to the mind and entire nervous system and an increase in general nutrition are among the promptly noticeable effects of vaginal bi-polar faradization. The irritable nerves are soothed, sleep is improved, appetite and digestion and renal elimination and other functions are benefited. Women with painful menstruation and tender ovaries, with chronic disease of the uterus, and the general nameless distresses that afflict the victim of Pandora's miserable gift to her sex are unfortunate indeed if they do not learn the good that electricity will do them.

Static electricity, the oldest of medical currents, will receive our attention next. It will not cause electrolytic or chemical actions, and owing to its thin stream of generation it must be *accumulated* by a condenser before it can be used at all. The insulating platform and small Leyden jars are the two forms of condensers that enable us to treat patients with sufficient current to produce curative effects.

What this agent can be made to do in causing medical actions in the tissues depends largely on the equipment of the physician in quality of apparatus and technical skill. A large current, a great variety of electrodes, and an Artist's mastery of methods and dosage make this device an instrument of precision, not surpassed in the entire pharmacopœia. But lack of skill can make this machine very disappointing.

The constitutional effects of simple Static electrification are governed by the existing deviations from health. When health is normal electrification does not alter it. But when functional processes are deranged the effect of this current is to regulate them to normal and restore the healthy condition. Aconite cannot break a fever if the patient has no fever and Static electricity cannot relieve pain if the patient has no pain to relieve.

But in all conditions of ill-health (without acute fever) which affects the nervous system, muscles and joints, the circulatory and secretory systems, functional processes and nutrition, we can make Static electricity one of our most sovereign remedies. It may be made—by different methods of employment and different dosage—to increase, diminish, arrest, or otherwise modify all the functional processes of the body, and thus we can improve sleep, appetite, digestion, respiration, circulation, excretion, absorption, reflex action and nerve tone.

It sets free the potential energy of the cells of the human organism and thus enables us to aid Nature in her weakened moments; and it is by this *constant co-operation with the forces of Nature in the body* that electricity does its work. By selected methods of treatment we can make Static electricity increase the excretion of urea and lessen the uric acid in the system, and these results are the effects of promoting better *oxidation of food.* This better combustion of the food leads to a better appetite, and with this change the whole round of nutrition is stimulated, and all by the simple means of nature's own processes re-inforced by electricity. The helping principle is the same as when a cartman puts his shoulder to the wheel to aid his horse in pulling the wagon over a rough place in the road.

So many and various are the technical resources of administration and dosage that the Static machine resembles the keyboard of a piano—on which the novice can raise sundry sounds, the average player compass simple tunes, while the Paderewskis and Rubinsteins of music can entrance the angels with their harmonies on the same instrument.

The use of the insulating platform as a condenser supplies us with technics and actions which cover an extremely wide range of work, some of it unrivalled in electro-therapeutics and unsurpassed by the choicest gems of drugs. By the use of small Leyden jars as condensers we obtain other methods which take us practically through the field of induction coil currents and the technics of high-efficiency faradization, but greatly surpassing the faradic in power of action. The dermatological effects of small iron-electrodes and ultra-violet-ray lamps are given to us by the Static machine, as stated in a previous chapter. The method of general tonic electrification by an *interrupted charge* and its local applications which employ but a single pole covers an important range of treatment. Owing to the fact that this method impresses the body with successive and rapid charges and discharges—as Hertzian waves are set up by a spark—the name of "Wave Current" has been given to this method which was originated and published by the present writer in the early part of 1893. Six years later (in 1899) it was advocated by others without credit to its author.

He who commands this flexible therapeutic keyboard with the technics which the author has placed on a scientific basis of accuracy in respect to dosage and *the production of definite effects to meet the diagnosis*, can make it yield a greater range of benefits to patients than any other single curative agent known to medicine. Disregarding in what follows the designation of each method required to shade the effects produced we will briefly summarize enough of the facts of physiological action to inform the reader of something of the worth of an instrument which most electrical engineers know only as a toy.

With Static electricity we can cause muscles to contract, and more deeply and beneficially than by almost any other current. Every cell of protoplasm is included in the contraction. It disturbs the molecular arrangement of tissues and causes a new structural arrangement which straightens out many of the symptoms which result from irregular arrangement of the molecules—something as we may take a rough-dried towel, shake it, and see its tangled fringe straighten out its strands as we whip them into new shape. It places under a tonic tension the nerve fibres, nerve cells and nerve centres. We can set up a direct stimulating massage of soft parts or a fine oscillatory vibration with a sedative-tonic action on the entire body. We can promote the nutrition of every part the current excites, create a feeling of refreshment to the entire system, and remove the sense of fatigue in tired patients.

Upon the skin we can set up a revulsive action and make the current either sedative or counter-irritant by opposite methods—and both as a sedative and counter-irritant it is unsurpassed. Its reflex actions upon the deeper organs are of great value in disease, for counter-irritation is an old and time-tried remedy in many ills.

Static electricity will warm, energize, compose, and relieve a great variety of irritable states of the nervous system. It regulates and strengthens the pulse when it is either too slow or too rapid and feeble, and it is a powerful tonic to the heart when the heart is weak. In our practice we have seen it take twenty beats from a pulse of 120, energize the heart, increase the force and volume of the circulation, relax anxiety, compose the respiration and restore comfort to the patient in ten minutes. Women in the discomforts of menstruation lose their backache, headache, heaviness, nausea, and circulatory disturbances in a few minutes on the Static platform and regain an agreeable sense of well-being. In states of nervous worry it often irons out the wrinkled troubles from the brain as the laundress irons the wrinkles from a shirt.

It is singularly calmant, eases the respiration in the dyspnœa of diseases of the heart and lungs, develops bodily heat when deficient, augments cutaneous transpiration, makes more active the urinary secretion and improves the functions of the kidneys, disperses nervous irritation, and gives tone to digestion and the whole organism. In a word, it is the great "dispenser of equilibrium" to the disturbed balance of the system in states of functional ill-health.

Its gentle tonic action in states of exhaustion is without a peer in the whole range of drug-prescribing. It is as soothing and grateful as fresh air, as restful as slumber, as refreshing as drink to thirsty tissues, and its restorative action in suitable cases is nearest to that of sleep and food. Many patients take a refreshing nap during treatment, and many a sufferer in laying aside his pains remarks after treatment, "I feel as if I had had a good night's sleep, had a refreshing bath and put on a new suit of clothes."

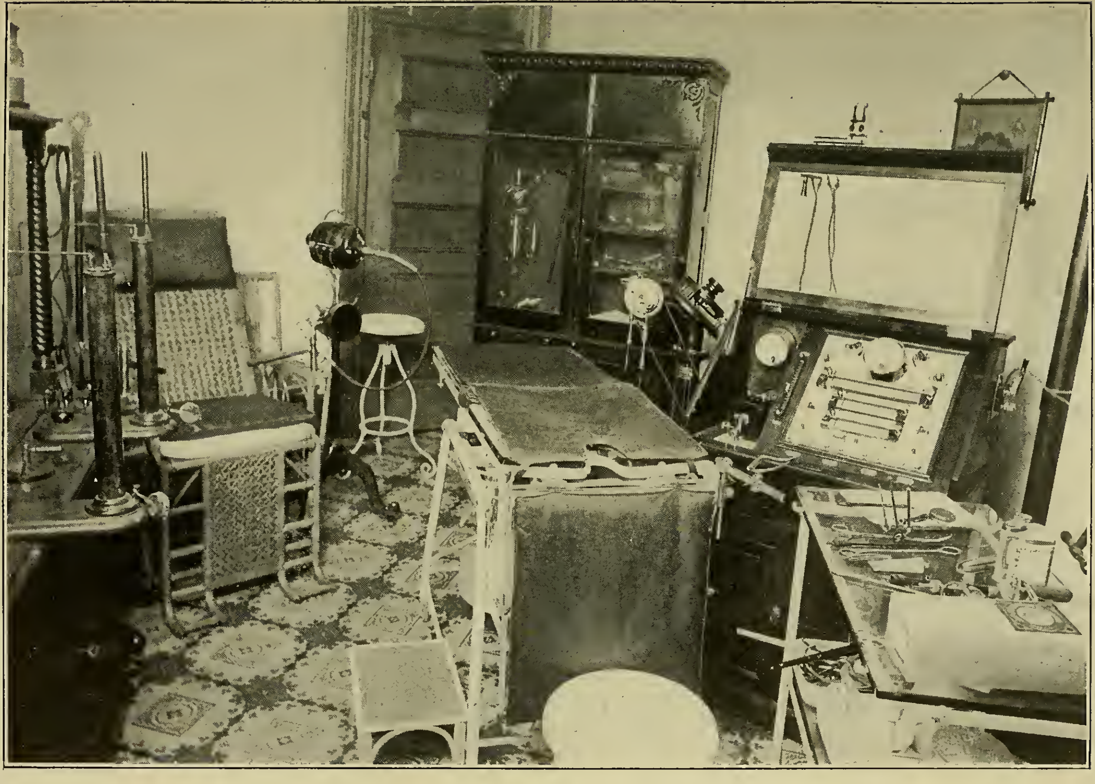
What we have here stated about the actions which the expert can cause Static electricity to set up in the human body was ascertained during three periods of medical investigation into its properties, to wit, 1750 to 1800, 1837 to 1853, and from 1889 to the present time. They are demonstrated *facts* and not the "psychical" imaginings of anybody. If there lingers any doubt anywhere as to the energy of this agent the skeptic can have his doubts removed in a few seconds on our Static platform. "Seeing and feeling is believing."

But back in 1806, Biot charged a hollow brass globe and demonstrated that a static charge—at rest—resided on the *surface* of the conductor. From this experiment nerve specialists jumped to the conclusion that static electricity acted only on the surface of patients and, hence, was fruitless for treatment. In 1842 Brewster showed that a difference existed between a hollow brass globe and a patient's body, and between the action of a charge at rest and a current in motion. But, the neurological tradition lingers and to-day most nerve specialists ignorantly refuse their patients the benefits of the agent because they hark back to 1806 and have not yet caught up to the teachings of 1842.

No other current has so high a voltage—and penetration is the product of voltage—and no other medical current demonstrably penetrates so absolutely and instantly every depth of the human tissues. In 1898, in the author's Instruction Paper for a Correspondence School, he stated these facts of deep penetration and they were disputed by an eminent consulting engineer. The Dean of the Faculty came with a four-page written thesis from the engineer showing that we were mistaken. Without stopping to read any theoretical arguments or caring for them when the means of practical demonstrations was at hand we placed the Dean on our platform, started the current into action and let it speak for itself. That was all that was necessary. The Dean got down and went home with an observation about his theorizing consultant which was too vigorous to print here.

We have yet said nothing about the $x$-ray work of this apparatus, but it fully covers the $x$-ray work of the large induction coil. This is stated in another section.

But it is not enough to buy a thousand-dollar Static machine; the physician must learn how to use it. When he has done this properly and can master the essential conditions of use, when technique is at his finger ends, when he knows how to command each special



ONE ROOM OF A PHYSICIAN'S ARMAMENTARIUM

This illustrates a small portion of the variety of apparatus required for the medical work described in this book. At the left is seen only a part of an X-Ray coil and high-frequency attachment. Just beyond is an adjustable auto-condensation chair. Beyond the chair is a motor-massage instrument, a high-class "vibrator." At the right of the cabinet is the author's Tissue Oscillator. The marble base in the cabinet beside the operating table is the switchboard of a combination adapter of the street current to furnish medical currents for galvanic, faradic, sinusoidal, cautery, and endoscopic work, and means of dose regulation. These things are but a small part of a full equipment.

effect it can produce, when he can proceed with directness of purpose and decisive action to relieve his patients of suffering and to benefit them in needed ways—with self-radiant confidence and easy skill on his part, and with satisfaction on the part of the patient—the Static machine will secure a place in the affections of grateful invalids that nothing else in medicine can approach. To the physician himself this great machine will become as indispensable as his right hand. He may admire it at first, but he will finally revere it in greater esteem as the years go by.

At first we stopped here in the discussion of this machine, but it is so unknown to the myriads who need it and is so discredited by those who have seen it badly handled—for ignorance can abuse even a crowbar—that much more on the subject should be said. The merits of this agent are not to be measured by the opinion of a mere observer: they are demonstrable upon the tissues of actual patients. The fact that gold lay undiscovered in California until 1849 did not prove that the precious metal was not there before, and the present lack of information about Static electricity does not lessen its rich resources for the treatment of disease. The great need is to make them better known.

For in some way in skilled hands, at some stage of treatment, this really noble agent can render service in more than half the range of pathology. Moreover, a few weeks of Static treatment scatters so many of the *little troubles of life* that are not definite diseases: it is so comforting to mental and physical ills that have no medical name: it can tide us over so many emergencies that would otherwise leave the marks of age upon us: it can so marvellously conquer pain: it can bring such instant strength and rest to weary feet and aching backs that faint under burdens it will quickly make light: it is so competent, so practical, and so decisive when it is indicated that its effects must inspire the admiration of every beholder even as they command the grateful affection of all who have rejoiced in the blessed benefits of this matchless handmaid of the physician.

It puts the crown and capsheaf to its achievements when it comes to the aid of perplexed and baffled medical skill in obscure conditions. When diagnosis is difficult and previous treatment has yielded poor results, and in these anomalous cases when medicine fails, it affords the patient a symptomatic relief that is the next best thing to cure.

# CHAPTER VII.

## THE HIGH-FREQUENCY CURRENT, VIBRATION, AND X-RAYS.

The Physiological Basis of Medical Treatment with these Agencies; Showing what Curative Actions they Can be Made to Produce in the different Tissues of the Body. The Demonstrated Facts of Approved Research and Experience.

With the curative actions of the basic medical currents well understood from a reading of the preceding chapter we may now make a sweeping summary of the electrical resources which supplement and spring from them, for in our next chapter after Light we wish to begin the subject of diseases and their cure.

The most important supplementary current is derived from the High-Frequency apparatus. It is used by both general and local methods of administration. In general electrification the patient *feels* nothing. In local applications there is a sense of pleasant warmth at the site of the electrode—which is most often a low-vacuum glass tube. These are made in great variety to suit the treatment of any surface of the body, and rectum, vagina, uterus, urethra, eye, nose, etc.

Sensory stimulation can be set up by a variation in technique. Muscular contractions can be set up by other methods. With general treatment the patient does not disrobe, but reclines at ease on a couch or chair. Local applications require direct contact of the electrode, as with other currents. During local treatment the entire body is also charged, but much less energetically than with large Static currents with platform condenser.

The properties which commend H-F treatment to patients and physicians are its improvement of nutrition, its very great power to relieve pain, and its soothing influence on the nervous system. It is the modern nearest substitute for the Static machine and has some facilities in administration which demand less skill.

A very exhaustive series of experiments made by two French physicians of the Montpellier Faculty of Medicine proved that by the use of this current on tuberculous guinea-pigs an actual inflammation is produced around the pulmonary foci and this finally abates, leaving the lung clear of bacilli. This has confirmed its extensive use in the treatment of consumption.

Other physiological effects have been published by Drs. Doumer, Oudin, Tripier-Apostoli, d'Arsonval, Guillaume, Bouniot, Bordier, Lecomte, Berlioz, and a host of others. The condensed facts are as follows:

These currents exert in a majority of cases the most powerful and generally beneficial action upon diseases due to impaired nutrition, and they do this by accelerating organic changes and combustion. This is proved by analysis of the urine in hundreds of cases, with results as summarized by Berlioz:

"The quantity becomes more normal. The products of organic waste are better eliminated. The increase of combustion is shown by the diminution of uric acid, while the percentage of urea is generally increased. The elimination of mineral salts is also changed but in a less marked degree.

When daily treatment is given for fifteen minutes we generally observe the following modifications in the condition of patients:

Return of improved sleep.

Increase of strength and vital energy.

Increase of cheerfulness, of power for work, and ability to walk.

Improvement in appetite, digestion, etc.

Increased oxygenation of the blood.

An increase in arterial tension.

Progressive improvements in the general functions.

The discharge of this high-potential current through air disengages the oxygen atoms and re-forms them as ozone, and the odor of ozone is marked during a local treatment. It is assumed by some that this ozone is directly driven through the skin into the tissues and accomplishes an "ozonization" of the blood. A prominent pathologist of this city recently stated at the meeting of a medical society:

> "During the past five years I have had the pleasure of seeing and examining the blood in a large number of cases which Dr.——— has treated by this method. They include almost every kind of disease. I have many microscopical photographs of these blood examinations showing the changes the blood has undergone. As the health of the patient has improved the blood also rapidly ap-

proached normal. I have watched a large number of these patients recover their health.

"I have never seen more active, beneficial change in the blood under any other treatment. In an apparently fatal case of blood-poisoning, and after seventeen days of treatment, I secured a photograph of the blood which showed, in comparison with the first examination, an increase of 1,500,000 in red blood corpuscles to a c. cm., and a reduction of 44,000 in the number of leucocytes. The haemoglobin at this time was only 65 per cent. Within twenty-six days from the first treatment she was considered cured and was dismissed. One month later I found that the haemoglobin had increased to 88 per cent., while the red blood corpuscles and leucocytes were normal.

"Another patient was suffering from paresis. His condition was critical and apoplexy was anticipated by his physician. The patient was disqualified for business and was constantly under the charge of an attendant. At this time there was but 85 per cent. haemoglobin, 3,500,000 red corpuscles, 7,000 leucocytes, and embolic fibrin and microcytes were abundant. The bunching of the cells shown in the microphotograph taken is peculiar to apoplexy. In one month the predominating symptoms were absent and he was so far recovered that he could resume business unattended.

"I examined the blood of this patient four months later and found it almost normal."

The actions which *vibration* will set up in the human tissues explain its uses in disease, but with a dosable mechanism operated by a tireless electric motor the short account we can give here will do scant justice to the subject.

Therapeutic vibration applied to the soft tissues of the body exercises on these an effect of rapidly alternating expansion and pressure which accelerates the circulation in the capillaries and lymph vessels, increases absorption and causes morbid infiltration of the tissues to disappear.

Of still greater importance are the effects upon heart and blood pressure. The researches of Hasebroek established the following results of vibration: Lowering of the pulse rate. Improved tone of the cardiac muscle. Vaso-motor increase of arterial tension. Increase of blood pressure. Increased excretion of carbonic acid.

Vibrations facilitate the peripheral circulation and improve muscular nutrition by stimulating the heart to a greater activity, and by promoting in valvular diseases the compensatory hypertrophy so beneficial in these cases. They constitute an indispensable auxiliary to other physical methods of treatment. The essence of the treatment of heart diseases by vibratory massage is the mechanical actions on veins and capillaries.

The physician who has read any treatise on Zander's work needs no instruction as to the physiological actions of the Tissue Oscillator. Suffice it to say here that whatever else this deft machine may do, its main appeal to patients will be its local action upon tissues—to increase *combustion* in states of excessive inertia and adipose; to increase *nutrition* in states of deficient fat or oxidation; to give sets of muscle-fibres active work with the system passive; to energize the general circulation; to determine a greater supply of blood to a given part, or to scatter stasis, abate congestion, and dilate the capillaries of the skin; to stimulate the cutaneous nerves, set up the warmth of intense tissue-activity, relieve the pains of cold conditions, and when all is done to leave the patient rested, benefited and refreshed.

This Oscillator is essentially a means of inducing *direct local exercise* in the tissues of a part of the body which otherwise would remain inactive or out of balance with the normal energy of the body. As muscular exercises are "*effective means, impossible to substitute*" for maintaining the equilibrium of the heart, nerves, and organs in a vigorous state, so a means of applying a definite dosage of potential energy by mechanical power is one of the primary requirements of physical therapeutics.

The real actions and uses of *x-rays* are probably more confused in the public mind than any other phase of electrical treatment. The instruction in *x*-ray diagnosis and *x*-ray therapy occupies 458 large pages in our text-book for physicians on the six branches of physical agents, but it will suffice for the lay reader if we simply state in a few words exactly what diseases *x*-rays will diagnose and what diseases they will successfully treat.

Diagnosis requires many helps—and needs *more.* The eye is the chief factor in medical examinations and the greatest instrumental aids to diagnosis are those which aid the sight of the examiner. *X*-rays bring new and rich tribute of information to the eye and take their place among the indispensable resources of the surgeon; but they do not, as the unread suppose, enable us to see the interior of the body as a picture. Nerve pains, stomach derangements, lumbago, sciatica, diseases of the soft parts—none of these ask help in diagnosis from the $x$-rays, for they cast no differential shadows on the screen and plate.

The conditions of injury or disease which $x$-rays assist to diagnose must involve one substance which differs in density (and opacity) from the surrounding tissues. This necessary condition is presented in the case of bullets and most foreign bodies lodged in the system. It is also presented in the case of fractures, dislocations and diseases of bones, stones in the bladder and kidneys, and, to a less extent, in a variety of small pathological changes localized in tissues of greater or less opacity. For this work the training of experience is required, both in the fluoroscopic and radioscopic examination, but still more in the *interpretation* of what is seen. For this penetrating radiance does not label its findings and much of the work is like inspecting the contents of a room through a ground-glass window. Only the man who knows exactly what the room ought to contain can tell whether anything has been added or is missing. Only the medical and surgical expert can interpret the showings of $x$-rays.

High-class electrical generators costing from $300.00 to $600.00, vacuum-regulating tubes costing from $20.00 to $40.00, a scientific "compression diaphragm" device for accurate radiography—price $150.00, a remarkable "orthodiagraph" for accurate visual examinations—price $150.00, and an extensive number of accessary devices, including the yet too little used stereoscopic apparatus, have improved the correctness and quality of $x$-ray diagnosis very much in the past three years but there remains a much clearer development to be attained. The general adoption of *stereoscopic* methods alone will meet the surgeon's needs.

Treatment of diseased conditions by $x$-rays has tested their action in a very great variety of subjects, many of which are better treated by other electrical methods. But the conditions which $x$-rays will benefit are fairly numerous, important, and often of inveterate and intractable types.

Without attempting to repeat for the non-medical reader the exact findings of pathology, which would be little understood, we may simply say that if an uncovered portion of the body is rayed for an ordinary time with a medical dosage the patient feels nothing. But a slow and profound action upon the nutrition of the skin, and (with diminishing degree) in the tissues penetrated beyond the skin, gradually develops by repeated exposures to the rays. The first sign of action that appears to the patient is much like the first evidence of commencing sun-burn. The skin shows a little redness, and heat or itching.

This is an inflammatory reaction to the over-stimulation of nutrition. It is an action of "irritation." When it appears treatment is stopped until it subsides. But in the early days when technics and actions were not worked out, a few cases of this reaction were kept under intense and continuous treatment and so we know the results that occur from *abuse* of this agent. The inflammation goes on to ulceration. This is succeeded by atrophy of the tissues. At the end they are destroyed. Meanwhile the patient has suffered much. But this side of the picture must be forgotten—it is outlived, and was one of the incidental evils of pioneer ignorance in the search for medical light. Patients to-day profit by the mistakes that experience corrects.

In present treatment with *x*-rays new "lead-glass" tubes permit the discharge of radiance only through a "speculum" directly upon the part under treatment and protect the patient and physician from all diffused rays. The art of dosage has been acquired. Caution has taken the place of investigating zeal. Limitations have been defined. Those who look back to 1902 can see marked progress. Perhaps the state of recent *x*-ray therapy cannot be put into more interesting and intelligible form for the lay reader than to cite briefly from a contribution to a medical journal:

> "The Roentgen rays have demonstrated a practical power to alter cells of low vitality and stimulate regenerative changes. It is because their medical action is *stimulant* and *alterative* that they have found so wide a field of application. Whenever they can be applied to stimulate altered metabolism or act upon pathological cells of low vitality, they have proved effective agents.
>
> "This demonstrated power to produce beneficial results in conditions that have previously been hopeless or have become chronic, makes it essential that every conscientious practitioner should appreciate the conditions in which they may be relied upon to aid in treatment, either primarily or as supplementary to operation or other methods of treatment.
>
> "For convenience the classes of cases may be divided into:
>
> "1. Non-malignant skin lesions, including tubercular and glandular lesions, neuralgias, neuritis, and rheumatic conditions.

"2. Superficial and deep malignant growths—cancers, sarcomas, epitheliomas.

"The action of *x*-rays upon skin lesions is apparently more thorough than that of ointments and lotions; it seems to reach deeper and produce alterations and destructions of deep-lying pathologic tissues. This is forcibly illustrated in its action upon eczema and psoriasis. In eczema, whether of the dry or moist form, and in cases of even five and twelve years' standing, the treatment has proved remarkably efficient. The same is true of psoriasis. But in these cases of local manifestation of what is apparently a disease due to systemic causes there can be no guarantee against the recurrence of the disease in other portions of the body.

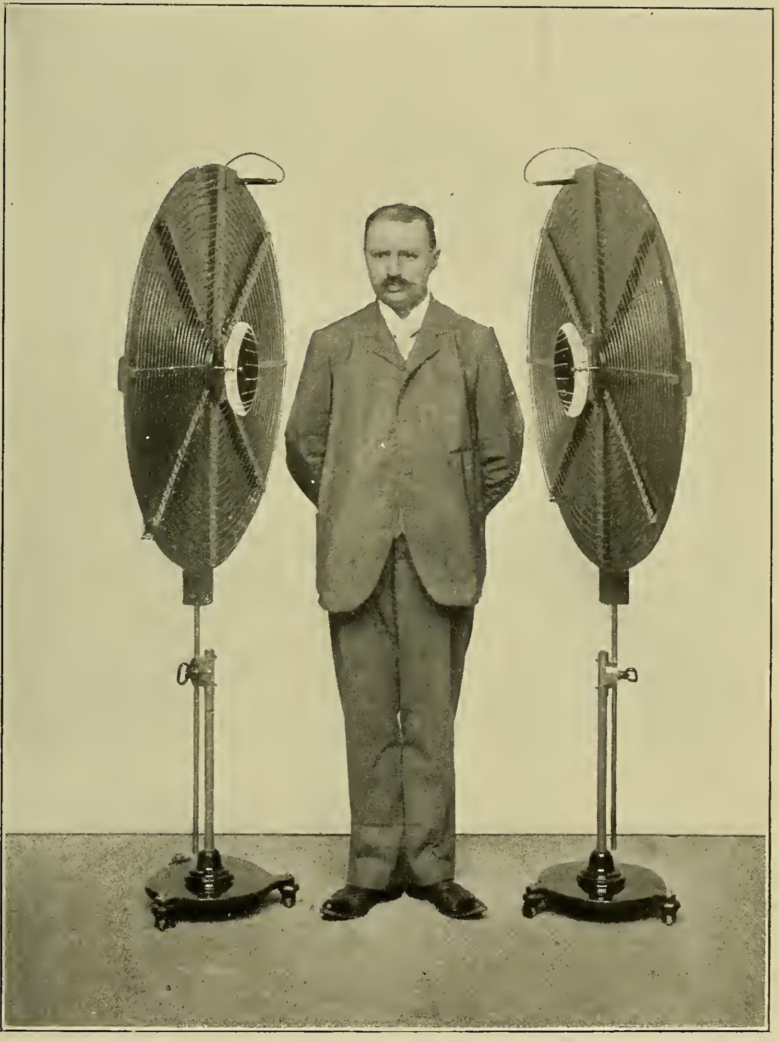
"One of the most remarkable effects which this agent has produced is the relief of pain. It was first noted in cases of cancer, where its palliative action is most valuable. In a case of acute neuralgia following influenza five short treatments gave relief immediately and resulted in a permanent cure. Encouraged by this result it was applied in chronic facial neuralgia of six months' duration, in a patient who had been subject to neuralgia for twelve years, with relief and finally a cure which has now lasted two years.

"It has also relieved a case of migraine in which frequently recurring attacks had persisted for twelve years, so that the patient has had no attack for fourteen months. A case of severe tic douloureux, in which an acute attack had resisted the best treatment for six weeks, was relieved almost immediately of pain and finally cured, and has remained well now for eight months.

"Where, however, there is a true neuritis with spots of local anæsthesia, nothing can be assured but temporary relief from pain, while the chances of complete cure depend on the chronicity and severity of the lesion.

"As might be expected, the pain of rheumatism yields to the analgesic influence of this agent, while the pathologic inflammatory process is beneficially influenced by its alterative action. The results in chronic rheumatoid arthritis are surprising, but are comparable to those it produces in other chronic conditions. The results in some cases of arthritis deformans are truly remarkable."

Acne, lupus, rodent ulcer, sycosis, tinea tonsurans, favus, vascular nævus, indicate the usual field of skin treatment. Local tuberculous lesions are efficiently treated. Deep cancers, of the stomach, breast, uterus, etc., have been extensively treated by *x*-ray and with great encouragement and equally great regret. Relief



A GENERAL ELECTRIFICATION WITH H-F TRANSFORMERS CONNECTED TO A SINGLE LARGE INDUCTION COIL

This plate shows a novel resonator, seen by the author in both France and Germany, employed as an alternative to auto-conduction and auto-condensation methods. The patient may sit or stand. A special connection of wires is used. The general electrification of the field between the two dischargers is that fine "vibration of the ether" of which we read so much. No spray is seen and no sensation is felt during treatment. The intensity of action varies with the energy of the exciting current.

and palliation have lasted long in many cases. Absolute cures have been shown in very few. Cancer is well-named "*malignant*" disease and the means of its positive cure, whether surgical or physical, is still far to seek. But without regard to cure physicians and surgeons can do much to keep pain from the patient and can sometimes prolong life.

On the morning of January 7th, 1896, the present author wrote the first article on the subject of *x*-rays that was published in a medical journal in America. He early standardized tubes suitable for the Static machine. His "Manual of Static Electricity" published in May, 1897, gave the first general instructions to physicians regarding methods and technique. In 1902, in a much larger treatise he brought his instructions down to that date. Since then he has editorially revised some two hundred medical journal articles. But the immense literature of this subject can be only understood by the reader with a medical, and electro-medical education, and we simply mention that it exists so that the public can realize that there is a more serious scientific side to this agent than paragraphs in the press ever took into account.

A generation ago it was the custom of many physicians to tell a patient for whom medicine failed to "get a battery and try electricity!" In every such case the article that was "tried" was a cheap and nearly worthless faradic battery. Those days are gone. As we reverse a telescope and, gazing through the larger lens, see far away the pigmy figure of the man standing but a few feet from the reversed eye-piece, so down a similar vista of distance and diminished size shrinks the one-time "family battery" into deserved neglect. For in a true sense there can be no family battery; there can only be a proper use of electrical remedies when trained physicians administer them.

Passing now to the physiologic actions of various electrical energies, such as the sinusoidal current, the alternating current from the street mains, and other modifications of more familiar apparatus—and the reader now sees what a truly magnificent arsenal of electro-medical apparatus makes up the armamentarium of the well-equipped physician—we find our next phase of curative energy in the *Electric Light.*

Owing to the importance and novelty of this great remedy we can scarcely do it justice save in a separate chapter.

# CHAPTER VIII.

## LIGHT THE HEALTH-GIVER.

How Modern Science is Making Light Rays into Medicine. A New and Important Advance in the Healing Art. Inventions that Supply Intensified Sunshine to the Physician. The Medical Actions of Luminiferous Radiations and Radiant Heat. Diseases once incurable now Treated by this Remedial Agent.

Every one knows that light—sunlight—is necessary to both animal and vegetable life, but only the most advanced physicians and scientists working in this new field of photo-therapy are aware of the existence of modern inventions which separate, intensify and make more actively *dosable* the medical energies of the sun. The Story of Light is of great interest to the sick and we shall try to have them understand exactly how it can help them to get well.

A moment ago a gentleman in the electrical field called upon the writer. He has abundant information on some subjects, but the medical uses of solar rays is not one of them. In the course of remarks he said that he had heard it claimed that electric light was curing consumption—"which, of course, was absurd!" But was it? Rather, it was his own lack of up-to-date information that seems absurd to those who *know.* Physical agencies are curing all the cases of consumption that are cured anywhere, and Light is one of the physical agencies which is always prescribed for this disease. There is no cure without it. But before we describe the actions of light let us see how it came about that light rays were *taken out of Nature's hands and placed in the physician's.*

When Samuel Kier, in 1850, put his first glass chimney around a flame to "steady" the light to read by he started the world on a new career of education, for with a bright light it became possible for the first time in history to study after the sun went down. Before that date scholars, the clergy, and a few read books; the great mass of humanity was illiterate. There were few magazines then, for there was a small reading public. Men and women, tired from work by day, could not tax their eyes to read at night by any artificial means of illumination until the kerosene lamp and its glass chimney came into general use.

But it took twenty-five years to firmly establish the reading habit, for the lamps of other days had their infirmities. Then came the electric light. To the active reading, research and study which it permitted we owe the strides of progress in knowledge and invention that made the last quarter of the nineteenth century seem like the blossoming time of all history.

The electric light improved and underwent important modifications, and in the general arts men began to adapt its construction to special uses. Then medical investigators began to compare the *spectra* of different lights with the spectrum of the sun. The most important of many scientific experiments by the pioneers were those made at Cornell University in 1889–90. These results showed clearly the medical basis of light treatment in disease:

"1. That the electric light may be used under such conditions as to make it fairly comparable to sunlight in its power to promote protoplasmic nutritional activity.

"2. That the electric light acts as a tonic to plants and increases their growth. (The author has demonstrated this in his own office in the case of electricity.)

"3. That the electric light is a true vital stimulus."

The last five years of the nineteenth century were made memorable in medicine by the well-exploited work of Dr. Niels Finsen, in Denmark, the winner of the $50,000.00 Nobel prize. He secured the first world-wide recognition of photo-therapy and compelled the confidence of the medical profession in his results. Hundreds of physicians from all civilized countries (the author among them) subjected the light treatment to the most rigid scrutiny and it stood the test. The lay reader who questions the medical value of light rays can scarcely afford to doubt evidence that convinces physicians who are competent to judge.

Prior to Finsen it had long been known that white light was made up of combined radiations, but it was useless for the physician to study the possible actions of luminiferous rays during the forty centuries of recorded time when man depended on lights that smoked and blazed. Such sources of light as flaming pine knots, torches, tallow tips, candles, kerosene and gas, offered no inspiration to medical study of their properties, for none of them could be applied as curative agents. They had no capacity for safe and flexible dosage, and they had small *intensity*.

But the electric light was a revolutionary invention. It could be enclosed for the protection of the tissues. It had no smoke and no flickering flame to hamper research. It was not affected by draughts. It lent itself readily to physiological experiment. It could be directed at any angle and reflected in any direction. But, most important of all, in the arc and incandescent lamps we first obtained the means of producing at will a great intensity of "candle-power" and of practically duplicating the spectrum of Nature's Sun.

With the advent of this now diversified and flexible instrument of precision the medical scientist began his physiological tests. Means were devised to *filter* out of whole white light the special radiations of the spectrum which created the different bands of color in the rainbow, and their separate medical actions were determined. It was soon discovered that beyond the visible red at the radiant-heat end of the spectrum and beyond the violet at the actinic "chemical" end of the visible prismatic scale there were vibrations of light waves too slow, or too short, or too long, or too frequent to excite the human retina, but which had definite medical value.

Investigation showed that altering the composition of the glowing material in different lamps altered the spectrum of the light and thus gave physicians the means of controlling the medical quality of the rays administered. In the arc lamp the use of iron, carbon and iron combined, and other specially prepared electrodes, permits important variations of medical action and increases the curative value of light. Tests also showed that the amount of current, acting on the various "glowers" of special medical lamps, greatly influences the production of luminous and radiant-heat energy, notably at the ultra-violet portion of the spectrum.

Devices for eliminating the excess of heat in a powerful arc light using 60 to 80 amperes of 110 volt direct current render the selected rays suitable for Finsen's treatment of lupus. The mercury-vapor lamp produces a "cool" light in which the red end of the spectrum is absent and no heat-filter is necessary. With 500 c. p. heavy carbon incandescent medical lamps we deflect the excess of heat by a compressed-air stream and by proper manipulations. The 500 c. p. Nernst lamp gives us high-efficiency radiations with just enough warmth at regulated distances from the body to make a concentrated equivalent for warm and healing sunshine. The tantalum lamp, by the light of which these words are written, gives us a fine white light with a heat dosage which adapts it well for still other medical purposes.

But common familiarity with electric light for *ordinary* illuminating purposes has *un*-prepared the average physician as well as the public to consider it a *curative* agent. If *light*, it may be asked, really possesses the medical properties that scientists *prove* it to possess, how is it that millions of people work for hours daily near arc and incandescent lamps without any of the effects now brought to our attention? Perhaps, uninformed readers will make this reasoning an argument for rejecting the whole structure of photo-therapy, but the explanation is very simple and is as follows:

For ordinary illumination light is *diffused* instead of concentrated. Commercial lights are made to yield luminous effects to suit the convenience of the eye without regard to internal tissues. The practical purpose of *Therapeutic Light* is radically different. It is to furnish the physician with an artificial sun which he can command at will, and focus, filter, modify and direct, to set up certain physiological actions upon a definite local area of the body, or otherwise to influence the general system.

Between the neutral actions of diffused illumination in which a person may pass hours at a time with no more than the imperceptible tonic influence of light *vs.* the dark, and the scientific therapeutics of concentrated rays filtered out of the spectrum for specific chemical, nutritional, or radiant-heat actions, and focussed upon a definite area of specially *prepared* tissues with a *definitely dosed intensity* of from a single thousand up to 60,000 candle-power, there is a difference similar to that between washing the hands in a basin of neutral water and the full resources of modern hydraulic engineering. The reader should comprehend what this means. Neither one kind of light, nor one form of apparatus, nor one dosage, nor one technic, is the whole of phototherapy.

To secure the many grades of effects needed in medicine we employ many mechanical devices to alter the latent energy of light into an agent of the materia medica. It must be prescribed to meet medical indications. It must also be *dosed*—as every drug must be dosed—to act correctly. The dose may be restricted possibly to chemically acting rays, or to radiant-heat rays mainly, or to both in modified combination; or whole light of dosed intensity, and with all its complex mixture of medical properties, may be needed for the given case.

Thus, medically constructed lamps, lenses, reflectors and accessary devices explain the difference between *reading* and *treatment*, and show that in modern electric photo-therapy we have a potent and flexible instrument of precision—equal to the sun in its essential factors of light and immeasurably more manageable in its application to the patient. The value of sunshine in health and disease is beyond argument; the value of controlled dosage of equal rays from a closely related source (electricity) has come to be as indisputable in actual practice as is the fact that an electric light will make a photograph.

In the experimental stage of clinical research it was soon found that to produce the most active curative results in the treatment of diseased tissues three conditions must be complied with:

In the first place a large *quantity* of intense radiation is necessary, and under nearly all conditions of dosage "quantity" is the indispensable factor to enable a given complex of rays to produce curative actions and alter pathological states. For this reason medicine uses from 300 c. p. up to 60,000 c. p.

Secondly: the radiations must be collected and multiplied by scientifically constructed reflectors so that the rays directed to the tissues will be parallel, concentrated, and focussed, according to the therapeutic requirements of the patients.

Finally: these intensified radiations must *penetrate*. They must go through the skin and reach blood-vessels, nerves, and internal organs. It is not enough to pour light rays upon the outer body; certain things must be done to send the rays deep into the tissues so that the healing action can exert itself where it is needed. In ultra-violet photo-therapy the means devised to secure penetration is the costly rock crystal compressor. In all cases, with all forms of lamps, the rays must be applied directly through the uncovered skin of the part of the body needing treatment, as clothing impedes the passage of luminiferous radiations. The rest of the treatment is *time* and *technique*, followed in many conditions by an after-treatment to conclude the effects.

Take, first, Finsen's therapy. The developments of his pioneer work rest on three *proven facts*:

1. Chemical rays of light—the field beyond the blue—will destroy *bacteria*.

2. It is the chemical rays which produce sunburn, and they will cause inflammation in over-doses. (In proper medical doses they stimulate healing.)

3. The chemical rays will penetrate the skin, even photographing a landscape through the entire body. (Numerous men have demonstrated such photographs.)

Says Finsen, in one of his reports on researches: "Widmark's splendid series of experiments for the first time afforded scientific proof that it is the ultra-violet rays that produce light-erythema, and I have confirmed and extended his observations. The powerful influence of heat and cold upon the expansion and contraction of blood-vessels and capillaries is not likely to be underestimated, but the effects of light are less generally known. That the chemical rays produce dilatation of the capillaries I have demonstrated by microscopic observation on the tail of tadpoles, and that this action with modified exposures has a certain advantageous influence scarcely admits of doubt. It may be presumed that there will flow more blood to the skin when the capillaries are distended, and that this improves the nutrition of the skin and makes it more able to perform its functions. The dilatation of the capillaries and blood-vessels produced by light is not altogether an acute or rapid progress, but is in reality of long duration."

Light, as are all other manifestations of medico-electrical action, is a great reliever of pain. An interesting note on this point was made in 1901 by the Senior Medical Officer of the Imperial Bodyguard Cavalry Regiment of Russia:

> "To-day scarcely any one doubts the energetic therapeutic action of blue electric-light. The undoubted superiority of this agent depends upon its action on the vasomotor nerves. Certain effects of blue light are the reverse of those of white light. For instance, a granulating (healing) surface will become anæmic under blue light and hyperæmic under white light. *The degree of pain-relieving power possessed by blue electric light is far greater than I had hitherto supposed.*
>
> "Although I had often been astonished at the alleviation brought about so quickly in acute pleurisies my experience now shows that far stronger claims may be made for its action in this respect. We now resort to the application of these rays instead of cocaine to render painless the incision and stitching of wounds, and the blue electric light rays not only cause a more complete anæsthesia, but powerfully promote healing from the beginning."

Of the actions of arc-light rays in the general treatment of the body within a therapeutic cabinet the following are the result of twelve years' experience—not the mere presumption of a casual bystander who never treated a case, but the *experience* of a physician who has treated, observed and reported hundreds of cases:

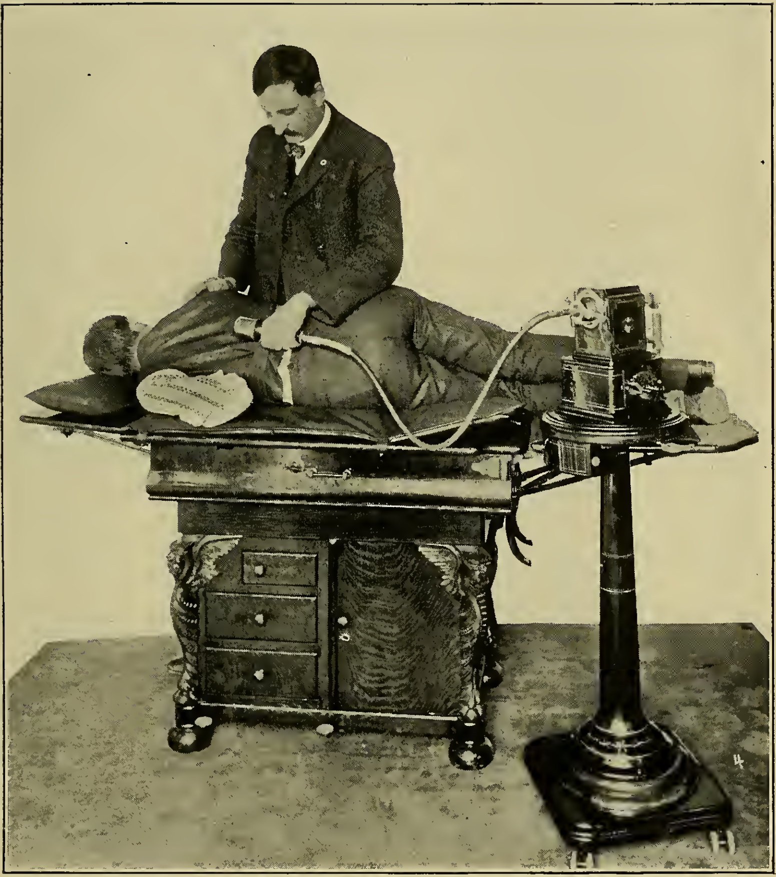
"That arc-light therapy has some physiologic effect by reason of its heat-rays cannot be gainsaid in view of the well-established action of heat upon nutrition. Nor should the value of the ozone generated be lost sight of. Its physiologic action is to increase the number of red blood-corpuscles, the hæmoglobin, the urea, and to establish nutritive changes, and therefore, in the arc light cabinet the benefit is not the result of actinic rays alone. Action from the visible spectrum must also be considered.

"The effects noted have included the establishment of circulatory changes with a uniform regulation of the heart's action (as shown by improved volume and slower rate of pulse), a temporary and slight rise of temperature, increased activity of the skin, improved respiration, fuller, slower, and gradually increased respiratory capacity, together with diminished irritability of the mucous membranes, and lessened discharge in tubercular, bronchial, and asthmatic patients, and in catarrhal conditions of the nasal passages. There is an increased excretion of urea and $CO_2$, accompanied by an improvement in nutrition and function.

"Patients treated in this cabinet light-bath have uniformly presented an appearance of being rested and refreshed, and not infrequently they fall asleep during the administration.

"In diseases of the respiratory system a soothing effect upon the mucous membranes is always experienced, while, from the first treatment, the cough and expectoration diminish. This has been noted in every case in consumption, but in cases treated too late for arrest of the disease, the relief is not permanent. Every case of bronchitis has had prompt relief from the cough and expectoration. In persons convalescing from acute bronchitis, bronchopneumonia, and grippe, with constant harassing cough, inability to sleep, great physical weakness, lowered nerve-tone, etc., relief has been obtained from the first treatment—characterized after a few moments in the bath, by fuller and freer respiration, lessening of the irritability of both nasal and bronchial mucous membrane, with diminished cough and expectoration.

"Upon conclusion of the treatment they have invariably presented an appearance of increased vitality. These improved conditions point to something which acts upon the mucous membrane of the throat and lungs as a powerful oxidizing agent.



ONE FORM OF VIBRATION APPARATUS

When the author's book of 1892 called the attention of physicians to this type of treatment there was no efficient instrument made in America. A few rather crude designs were made in Europe. To-day this method has become so widely recognized in medical practice that more than a score of makers now supply the American market, and mechanical construction has been greatly improved. Treatment is administered through ordinary clothing, and by different applicators all parts of the body can be treated to meet special indications.

"From the well-known physiologic action of ozone it is felt that it is a vital factor in *general* applications of the electric arc light for diseases of the respiratory passages. In profound anæmias, in the various manifestations of disturbed nutrition, in neuritis, rheumatism, and in such skin affections as acne, eczema, and psoriasis, the results are due to the chemical rays mainly. Their influence upon the capillary circulation initiates the circulatory and resultant nutritive changes, followed by the disappearance of the special manifestations of disease characterizing the individual case. The therapeutic indications are as broad as are those for sunlight and pure air."

The weight of evidence already here presented to show the medical value of rays of light is an exceedingly small fraction of the knowledge at the command of the physician. This entire book could be filled with the results of research. And these researches have not been made by tyros; they are the investigations of competent men, and no reader of the facts contained in these pages can justify any sceptical attitude toward them. Note, for instance, the immense experience back of the remarks we now quote; they were written about 1896.

"For more than twenty years I have made use of the sun-bath as a therapeutic means, and twelve or thirteen years ago experimented with large convex lenses for the purpose of concentrating sunlight, and thus intensifying its effects in the treatment of neuralgia, and spinal and other hyperæsthesias.

"Something more than four years ago I began experimenting with single lights provided with reflectors, and soon after constructed two cabinets, each containing fifty or sixty incandescent lamps arranged in regular rows inside. Since that time I have made constant use of electric light in treatment. Together with my colleagues I have administered nearly 10,000 light baths in a great variety of ailments, and have used it largely as a substitute for Turkish, Russian, vapor, and hot-air baths, all of which I had previously employed for many years.

"Finding it free from any of the objections of the other baths, and also finding its effects extremely agreeable to patients and remarkably efficacious in many stubborn cases which did not readily yield to other medical agents, I have employed it much more and in a wider range of diseases. My earliest experience with the electric light bath showed that it was capable of producing very characteristic effects.

"This led me to undertake a series of physiologic experiments for the purpose of placing its therapeutic uses on a rational basis, and for the purpose of comparing its effects with those of Turkish and Russian baths. Some of these tests were made three years ago: others have been made more recently.

"Three healthy young men were used for the tests. They were, on different days and under conditions as nearly the same as possible, given each of the three kinds of baths for five, ten, twenty, and thirty minutes. The baths were given at a uniform hour and a uniform diet was maintained. The average elimination of carbon dioxide before the experiments was 3.60 per cent. With the five-minute electric light baths this rose to 4.10, and with the thirty-minute bath, to 5.13. For the Turkish baths it ran 4.03—4.07—4.01. For the longest Russian bath it only rose to 3.96 per cent. The highest amount of elimination of $CO_2$ was 4.29 litres, this being in the Light bath.

"The temperatures of the baths in respect to air were 85° to 97° F. for light; 100° F. for the Russian; 131° to 155° F. for Turkish. The free perspiration and efficient elimination in the Electric Light bath occurs, be it noted, at temperatures constantly *below that of the body*, which is normally 98½° F.

"The facts determined in relation to the urine were: the amount, specific gravity, the acidity, the amount of urea, the amount of uric acid, the total chlorides, the phosphoric acid, and the total solids. The figures were determined by accurate quantitative analysis of the whole amount for the twenty-four hours. The results showed (table of figures omitted here as the non-medical reader would not understand their significance) that the electric-light bath is much more powerful than either the Turkish or Russian bath as a means of stimulating elimination by the skin. The amount of perspiration induced by light was fully double that induced by the Turkish bath in the same time."

The entire report of these scientific tests was published in medical journals and contains an elaboration of many details which would fill too many pages of this book to repeat here, valuable though they are. One important point settled was the greatly superior *penetrative* heat power of the intense rays of electric light. It is far more effective in raising both internal and surface temperature of the body than any other form of heat known.

The peculiar value of the electric-light bath of this variety is due to its efficiency as a source of radiant heat. The skin as well as the air is to a great extent transparent to radiant heat, and the same is true of all living tissues. This radiant energy penetrates the body to a depth of several inches.

The marked feature of the sun-like warmth in this bath of light is the fact that it is *radiant* heat instead of conducted heat. It is like the heat of the solar rays which pass through the cold spaces of ether and atmosphere to warm the bodies on which they impinge. Radiant heat, therefore, is more quickly penetrating than the "conducted" heat of a stove or hot-air apparatus. Conducted heat must first warm the space through which it passes, and such heat diminishes rapidly in proportion to the distance it is conducted. When it reaches the skin of the body it meets a barrier through which it, with great difficulty, extends effective heat to the inner tissues.

Therefore, all forms of application of either dry or moist *conducted* heat are less actively beneficial for the relief of pain, congestions, inflammations, and obstructions to the circulation and for the elimination of waste matter, than is the penetrating, energizing, eliminative and tonic action of *radiant* heat. The distinction between the two kinds of warmth is fundamentally important to the physician and his patients. One is a dull therapeutic weapon, while the other is keen and decisive.

Owing to its deep-acting eliminative properties the radiant-heat-light cabinet bath is the best means of restoring rest and energy to an overtaxed nervous system and a jaded body. In an emergency of business pressure it will (with suitable after-treatment) refresh the mind and muscles like a long night's sleep, and do it in an hour. For example:

An Associated Press manager was soon to address an electrical organization when the San Francisco disaster crowded him with work. As the date for his address approached he felt too exhausted to prepare his subject and begged off. Acute fatigue of this kind is due to the rapid accumulation of waste products in the system, their retention causing them to act as poisons. Tired nature and burdened organs fall short of eliminating these poisons as fast as they are formed and the result is exhaustion.

But such a man can secure relief and meet any engagement that demands his time. Simply place him in a bath of effective light and riddle his tissues with radiant heat. Eliminate the irritant products of waste through the sweat glands. Cool him off with water at 90° F. gradually lowered to 86° F. Then put him on the Static platform and impart a fresh stimulus to every nerve and muscle in his body. Then he is a new man.

It is quickly done. When it is done he feels as if he had awakened from the most restful sleep, and his energies are as completely restored as if he had. In many cases we have demonstrated this useful effect in men whose emergencies have compelled them to work all night without sleep, or who have lost sleep from mental anxiety or sudden strain and worry. In the light bath worries fall from the mind as dead leaves fall from a shaken tree. Such an instance was Mr. W. His story when he called upon the writer was this:

"I am passing through severe business worries. Last night I could not sleep at all. I could eat no breakfast and I had no lunch. Six years ago I had a nervous breakdown ending in an acute hysterical attack. I now feel just as I did when that attack was coming on. I can hardly keep from crying and am in a nervous tremor." Yet, he was a robust-appearing man and weighed 190 pounds.

Half an hour later his fear was gone. He felt, he said, as if he had slept all night, had a refreshing bath and put on a new suit of clothes. Worry had left his mind and he was ready for a square meal. These effects are a common experience in practice, and are a boon to those who need them.

In Berlin, notes on pulse, temperature, respiration, etc., have been published covering 4,000 cases. A large number of medical investigators have confirmed the earlier reports of results obtained by others. Proper treatment after the light baths with reference to hygiene, massage, gymnastics, rest, diet, and hydrotherapeutic measures must be employed on intelligent, medical principles to make up a complete treatment of scientific character, according to the indications. No branch of photo-therapy should be left to a non-medical assistant. The physician should give his personal supervision to the treatment and the dosage.

We have seen that by mechanical devices we can separate heat, luminosity, and chemical action from combined light. By means of special filaments and opaque glass tubes about ten inches long by two inches in diameter a bath has been constructed which aims to treat the patient mainly by radiant-heat effects to the exclusion of other properties of light. Several hundreds of this form of apparatus are in use and have been tested in almost every chronic disease. By condensing a hundred pages of scientific experimental research into a few words we may summarize the clinical facts thus:

Radiant Luminous Heat is composed of rays of the spectrum which can be separated from others for selected actions.

It can be reflected by mirrors and polished metals, as can rays of light.

It can pass through glass without losing its properties.

Radiant heat can be directed on a body without heating the surrounding air.

It does not vitiate the air. The dose is regulated by a rheostat.

The physiological actions, as determined by the investigations of Dr. Guyénot are as follows: Very marked reddening of the skin, very abundant perspiration and the elimination of increased quantities of carbonic acid by the lungs, a rise of pulse and temperature, increased excretion of urea and solids in the urine, and lessened uric acid, increase in the number of red blood corpuscles. The redness of the skin is due to the dilatation of the superficial capillaries, and the perspiration is the sequence of three factors:

1. The dilatation of the vessels, particularly those in close relation to the sweat glands, sebaceous glands, and follicles.
2. The direct stimulation of the cellular elements and the glands by various radiations.
3. The reflex excitation of the nerves.

The dilatation of the cutaneous vessels, and the necessity of the tissues to replace the fluids lost by perspiration, leads to a general movement of the blood and produces an increased circulation. This lowers the blood pressure and thus *removes the principal cause of painful symptoms* and at the same time carries away the morbid products in the circulation.

At this moment, under the prolonged action of the radiant heat, the larger arteries dilate and then contract according to the well-known laws of compensation. This takes place without disturbance to the patient and the luminous and chemical radiations add complex factors of benefit which are of incontestable utility.

All affections for which dry super-heated air is useful, whether local or general, are treated with greater advantage in the improved form of luminous radiant-heat bath; and physiological data and clinical observations are now so numerously demonstrated that in certain affections we have established precise indications and obtain particularly good results. Among these are gout, rheumatism, rheumatoid arthritis, phlebitis, bruises, sprains, fractures, excessive fatness, anæmia, exudates, coldness of extremities or body, recent and chronic "colds" and bronchitis, and to a less extent, sciatica, neuralgias, nervous diseases, diseases of the heart, lungs, and kidneys, many lesions of the skin depending on malnutrition, and various unclassified conditions of both functions and organs.

When intense high-efficiency light radiations from a specially constructed incandescent medical lamp of 500 c. p., using about 12 amperes of direct 110 volt current, are multiplied and thrown down upon the tissues in a splendid stream of parallel rays we obtain a means of *local* treatment of as great value in its way as is the cabinet for *general* light treatment in its way. Modifications of physiological action obtained by this vastly different method are of more interest to the general practitioner than are the Finsen actions, for they apply to a far greater number of diseased conditions than either Finsen's method or the *x*-rays. As an auxiliary to other treatment this type of lamp is one of the daily necessities of an office equipment. The author has adapted a six-glower Nernst for this purpose, and it has the advantage of generating only just enough radiant heat for treatment without requiring any controlling device.

The rays act as a powerful and safe *germicide*—destroying the various pus-producing microbes, and practically all other pathogenic bacteria, without injury to normal tissue cells. They are, therefore, useful in abscess, ulceration, and many lesions and wounds of the skin.

At the same time is exerted a distinct reparative stimulation of nutrition and this double action produces a more rapid healing.

The anodyne effect is marked. The warmth and penetrating radiations relieve a great variety of pains—sometimes better than any other form of electrical energy. We have entirely removed the pain of a severe but recent sciatica in a single treatment, without any future return. The first sensation of the patient under this light is one of comfort. As a well-travelled woman, suffering from extreme nervous debility, remarked: "It reminds me of the sun in the West Indies."

When we picture the clinical possibilities opened to the physician by the great sum of physiological actions which modern technics and an increasing variety of scientific apparatus can make electrical energies produce in living tissues, it is difficult to put before the non-medical reader an adequate comprehension of what these actions mean in the treatment of scores of diseases.

Too many minds, otherwise civilized, still take the view that electricity and a Chinese coolie's incantations to his Joss bear about the same relation to medical treatment. This obliquity of mental vision daily prevents an entire army of sufferers from securing the relief and happiness that proper electrical methods of treatment can so readily furnish. A patient continuing in misery because of ignorance of knowledge that trails down an entire century is an unfortunate being. The facts in this book should help many such.

And now, for a page or two, let us frame our mental picture of medical electricity in an outline of medical drugs—for comparisons which you can understand will make much more clear the value of electric currents.

In any list of the leading twenty drugs made by physicians of of any school of practice there would appear the names of iron, arsenic, quinine, mercury, aconite, belladonna, opium and strychnine. These are great drugs of great usefulness—but what diseases will any one of them definitely and specifically cure? Even in malaria quinine often fails, and in syphilis mercury has its exceptions; opium will not abate all pains, and iron does not correct all cases of anæmia; and all of these drugs have drawbacks in by-effects on the system. Yet, many would say off-hand that each of these drugs—and they are great drugs—was a greater curative remedy than electricity.

But let us see about the real *actions* of these remedies—for we prescribe them according to their medical actions, and for no other reason. A comparison will astonish all but students of the subject.

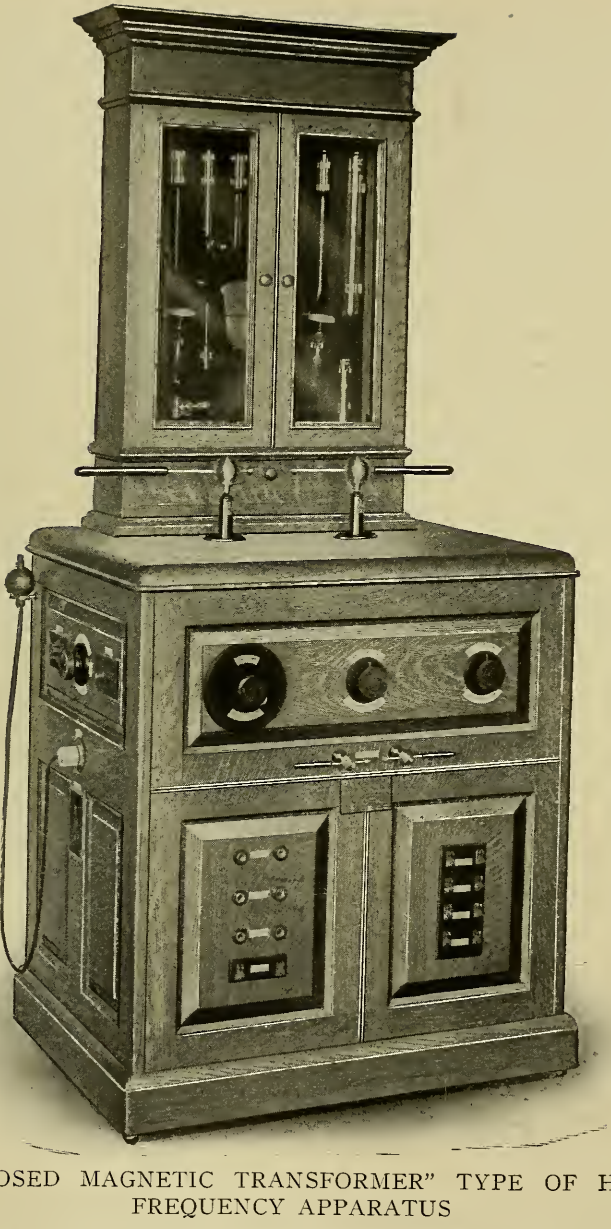
Setting aside acute diseases, for electrical apparatus is not sufficiently portable to take from house to house, and considering only the convalescent stages of acute disease and adding to them all chronic diseases, we find that the main action of opium, for example, is to relieve pain. Nine times out of ten that is what it is prescribed for. Yet that one action makes it a world-wide remedy, enormously used in all lands, and indispensable to physicians. It does not "cure" pain; it only relieves it during the action of the given dose.

The resources of medical electricity can not only abate as many pains as opium, but they are curative in all but the severer lesions which are incurable by any means at the physician's command. Opium is filled with danger to the patient; medical electricity creates no terrible habit as opium so often does; and it acts in harmony with nature and normal feeling, while opium dulls the senses, upsets the system and creates the after-effect which has given us the expression, "dopy."

Quinine apart from its malarial uses has the action of a "tonic." This one reason for prescribing it gives it extensive use, but it tends to congest the liver and is not to be taken with impunity. The *tonic* actions of electricity far surpass it. Strychnine is also a "tonic" and one of the most abused drugs among the great poisons—and the great poisons are great remedies—but the tonic action of electrical energies is not only much more—(*infinitely more*)—curative in chronic diseases than that of strychnine, but the physiological actions of electricity unite a more varied complex of benefit than all the "bitter tonics" combined. A single one of its many remedial actions enables it to be of far greater value than the renowned alkaloid of nux vomica.

In non-syphilitic chronic diseases mercury is mainly an "antiseptic" and an "alterative." In electrical resources we possess a safer and more potent enemy of germs and a greater and more powerful alterative. Look back to our story of the actions of the various electrical energies and we see that among the score of them an *alterative* and *germicidal* action is paramount. Will the reader say that mercury is a greater remedy in disease than electricity? Is a remedy with two actions greater than a remedy with twenty, in which the two are included and overtopped? Is a part greater than the whole?

And so on through a long list of familiar drugs—each has one or two actions which cause it to be prescribed. Iron oxidizes the red blood corpuscles; aconite allays a special type of inflammation and fever; belladonna has a narrow range of use; arsenic, one of the chief of drugs, fits only a small fraction of the many nervous states in which electricity is beneficial or curative; and iodine, the great drug alterative and counter-irritant, possesses but two of the many properties of electricity.



A "CLOSED MAGNETIC TRANSFORMER" TYPE OF HIGH-FREQUENCY APPARATUS

This shows the cabinet of an apparatus adapting the Tesla principle of induction to devices for producing the following therapeutic currents: High-frequency (Tesla, Oudin, and D'Arsonval); low potential H.-F. currents for auto-condensation effects; low and high potential sinusoidal currents; and various other modifications for general electro-therapeutics and exciting vacuum tubes. Compare its clinical value with the so-called "family battery."

With sufficient medical education to grasp the significance of a remedy which supplies the means of selecting and producing at will any one, two or more of twenty medical actions, it is apparent and *demonstrable* that within the same field of prescribing, drug remedies which only possess one or two properties are lesser curative agents. Until reading this enlightening survey of plain facts probably few who see these pages ever realized the simple truth.

But in still another way electricity is greater than single drugs in the treatment of chronic conditions. The difficulties of the physician in fitting a single drug to a curative action in chronic diseases is enormous. A gift of genuine clairvoyancy would help the doctor if he had it, but lacking "second sight" he is perplexed by the often stubborn refusal of favorite drugs to meet the desires of the patient. On the other hand, the principles of electrical action are not "chemical" but *physiologic*, and the application of them is on a much more exact basis than in the case of drugs which are chemical agents. The difference to the patient is tremendous.

Therefore, taking all factors of use into account, and premising that drugs and electricity must help each other in the physician's hands, it is conclusive that electrical resources cover a range of medical actions which it requires upward of fifty of the most important drugs to cover, and in many conditions the action of analogous drug agents is inferior.

No drug will set up exercising tonic contractions of any muscle fibres; but by a score of electrical methods we can contract as slowly or rapidly, as gently or vigorously, as deeply, as locally, or as extensively as the patient needs, the elastic fibres of muscles, the walls of blood-vessels, and all parts that possess the power of contraction. This property of electrical energy is of transcending medical importance.

No drug will set up electrolytic action in the tissues; but the polar electrolysis of the constant current is of both medical and surgical value—a value equal to the total services of a dozen drugs of very high standing in hospital practice.

No drug will stimulate the nerves and heart without a reaction; but electricity supplies the healthy normal stimulus of added vital force—and not only does the effect of a single séance last far longer than the stimulating effect of any drug, but there is no debilitating reaction.

No drug will calm excited nerves, or feed exhausted nerves, or arouse lethargic nerves, or refresh nerves that are worn with work, with the direct tonic action of electrical energies.

No drug will open the pores of the skin and cause healthful, profuse, and tonic elimination without depression. Electrical resources will. They surpass all other agencies in this respect. No drug can compare with electricity here.

No drug will reach the kidneys with a curative action upon chronic functional or inflammatory changes. Electricity does, and offers the only decisive treatment for Bright's diseases.

No drug will reach the lungs and arrest the depredations of the tubercle bacillus. Resources of electricity will do so in stages of the disease later than any other curative agencies will.

No drug will so act upon varicose veins as to enable the victim to put away his elastic stocking and forget he has it. Electricity will.

No drug will exert a curative action upon the glycogenic function when it is deranged and thus cure diabetes, even with the aid of the strictest diet. Electricity will restore the function to normal on a full mixed diet—unless treatment is put off until the hopeless stage is reached.

No drug taken internally will send its action through an indurated part; but electricity will soften the induration, disperse blood stasis, cause reabsorption of exudative material, bring to the part a new supply of fresh, invigorating and healing blood and hasten the healing.

When sodium salicylate is given in large doses for the relief of rheumatism it upsets the stomach. When colchicum is given for gout it does the same thing. When electricity treats these chronic conditions it eliminates the poisons and exerts its superior beneficial actions with no bad effects of any kind. And it will do more good to these cases than all the drugs known to medicine.

But not to continue these comparisons, which we could extend over a hundred variations of disease, will any one still say, in the face of the clinical experience of convincing years, that electricity and its complete modern resources are not an incalculable blessing to the sick?

Eight years ago a Georgia medical editor casually reviewed one of the author's text books and remarked: "Doubtless electricity can be used in all these diseases, but will it do any good?"

He then had only a "family" battery and *it* did no good. But competent electrical resources will "do good" in all the classes of cases mentioned in this book. We know it because we *do it*, and have been doing it for a considerable number of years, and the testimony of actual experience in indisputable.

# Some of the Work Done by Electrical Tools in Medical Practice.

*HE who reads the succeeding chapters with the mental picture before him of a full storehouse of tools—an arsenal of many weapons—from which the right one is selected for each special work, will grasp the conservatism of the author's statements in this book.*

As we write these pages each essential tool and technic, manipulation, *dosage,* time and frequency of administration, auxiliary measures of treatment, the combinations of effects required to meet the complex indications of chronic disease, the command of the full resources of modern medicine—these things spring instantly to mind in the consideration of each subject. But he who reads and judges of effects from the standpoint of a toy battery and a pair of hand electrodes cannot follow us. Aladdin is dead, and the mere rubbing of sponges on the spine has none of the magic of his "Wonderful Lamp."

# CHAPTER IX.

## HOW TO HASTEN RECOVERY FROM ACUTE DISEASES.

Showing that Electrical Energies are the Most Important Nutritional Tonics. Their Valuable Restorative Effects in Convalescence from Exhausting Illness.

In this book—the first authoritative treatise on Medical Electricity written for the information of general readers—our subject naturally divides into three parts: the electrical *tools*—the *actions* of each—the *work* done with them.

The tools have been made known in our chapters on apparatus. Their actions have been made as clear as it is possible to put them in words for the understanding of men without the mental pictures of the physician. And the work these tools and actions are daily doing in the treatment of disease will occupy the balance of these pages.

First, because of its neglected importance and because it rightly precedes and often develops diseases that are chronic, we shall show how the period of convalescence—recovery—from acute illnesses can be cut short, and women restored to their families, men to business and children to school, in much less time than is usual under ordinary forms of treatment. This period can influence the rest of life and too often does influence it for the worse, simply from want of the decisive help that electricity can give to those who need it.

Let us begin with children, for the health of the child is the foundation of the man and woman, and a sickly child is often a needless sufferer.

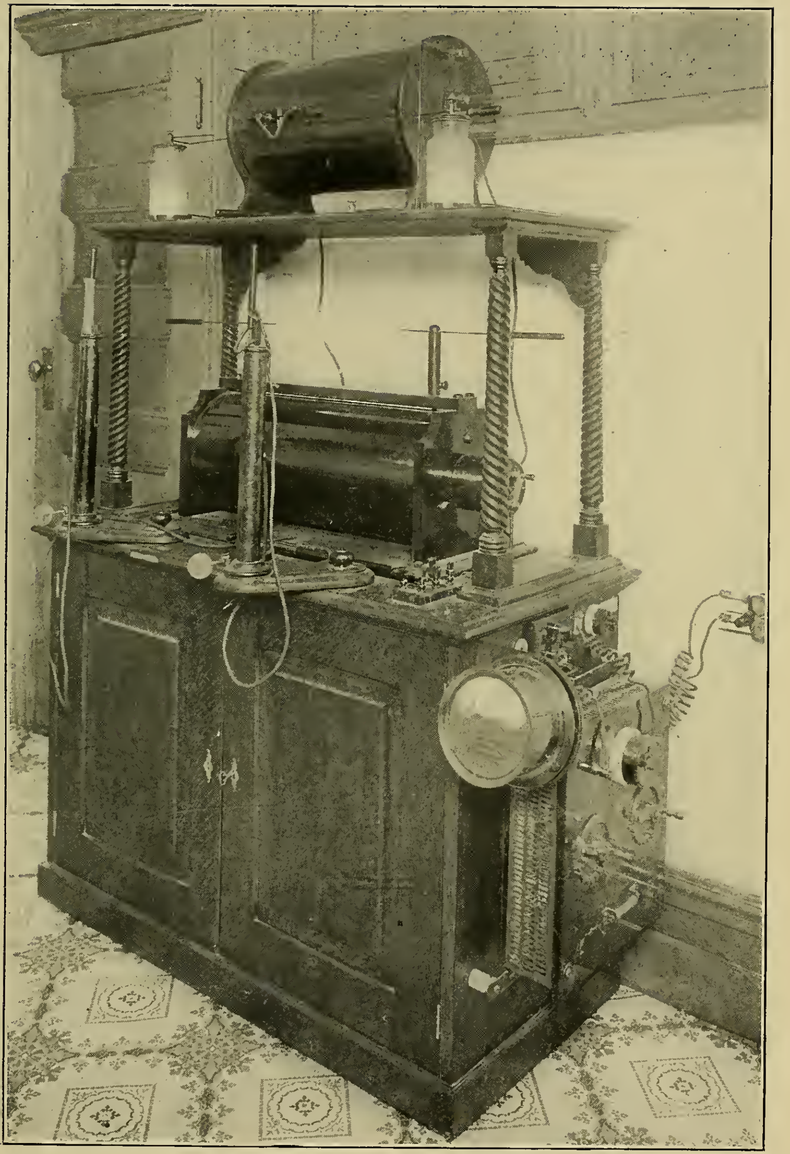
A mother brought to the writer a drooping infant seven months old, just past the crisis of capillary bronchitis, white-faced and weak. The little head fell on the shoulder and the eyes had no play in them. As she sat in the mother's arms on the Static Platform the color of red blood could be seen returning to the pallid face and the eyes brightened. When the treatment was ended she sat on the floor and began to play. A few treatments toned up this child and made her thrive vigorously in a fraction of the time that Nature usually takes to restore such cases. And Nature is not always *decisive*, and there is costly regret if the lungs do not clear and a relapse occurs as it is apt to do.

A man had pneumonia. For a week he lay panting for breath. Then, with much help, he was got into a chair. His muscular respiratory mechanism was made to expand and contract and dilate the air cells. His general muscle masses were invigorated. The nervous system was given refreshing tone. Sharp momentary counter-irritation over the affected pulmonary area started the process of resolution. The panting changed in five minutes to deep breathing and the extreme prostration took on a little strength. The rally thus begun was continued by another treatment three days later. Resolution went on to a rapid and complete clearing up of the lungs and a full return of the normal physical condition. Drug action may or may not induce the lungs to entirely clear, but electrical action is decisive and compels recovery.

An infant less than a year old had "summer complaint" and was still having exhausting diarrhoea. His toes were cramped upon the feet from the intestinal irritation and the mother was in hourly dread of convulsions. The sedative-tonic action of electricity allayed the nervous irritability and imparted tone to the functions. Stools fell from thirty the previous day to a half-dozen the day following treatment and in a week the boy was thriving and continued to do so. He had four treatments in all.

A little girl, seventeen months old, had found a pickle bottle on the floor when no one was looking and what she ate of the contents made her sick. With care she recovered from the acute attack of indigestion but failed to regain strength. The tonic action of electricity energized her functions, and a young child is all functions and easily influenced by general electrization. But ten months later her mother brought her again. She could not hold up her head. She was very pallid, anæmic, and debilitated. She had no definite disease; simply had again found some chow-chow and been left to nature for more than a month in the hope that the effects would wear off. Tonic electrization put her on her feet and she had no more trouble.

The calming action of electricity upon a young child's nervous system is of great importance in removing the irritations of infancy. A girl between three and four years old became excited and somewhat hysterical during a festive occasion in the family. Her



A "RUHMKORFF" TYPE OF INDUCTION COIL AND HIGH-FREQUENCY APPARATUS

This coil has an 18-inch spark rating for X-Ray work. The secondary contains thirty-five miles of wire wound in 600,000 turns. The cabinet contains a three-point electrolytic interrupter and a mercury jet interrupter. It is excited by from eight to twenty-five amperes of 110-volt direct current. The solenoid at the top is the high-frequency transformer.

mother was given to hysterics and when the situation permitted resort to the resources of electricity she had been calmed into control. The child was taken with her sobs and put on the Static Platform. Ten minutes smoothed out the storm and she re-entered the play in the happiest spirit.

When the writer was sixteen years of age he had a most severe attack of diphtheria. When the acute disease passed he was left to "time and nature." This process took seven years. The sensory and motor paralysis left the extremities in a few months, but the fauces and vocal apparatus felt the effects for three years. Speech was thick and some of the letters of the alphabet could not be pronounced. With modern methods of electrical stimulation the muscles and nerves could have been restored to normal in one month. It is needless to let any convalescence linger, and when time passes and nature has not been able to fully perfect her work it is a very great injustice to the child's future to waste invaluable months in partial invalidism. Practically every recovery can be hurried and completed by proper electrical technics.

The *sequelae* of acute and short-lived diseases often prove more tedious and disastrous to the patient than the initial invasion. States of anæmia, deficient nerve-tone, of organic and functional debility, of lessened tissue resistance, are created which unfit the individual for the duties of life or render undue exertion dangerous; and out of these states the slow processes of imperfectly aided nutrition conduct him with faltering and leaden step.

Relapses occur which renew and prolong anxiety, and when recovery reaches its limit there may or may not be the fullest possible restoration of anatomical integrity and the processes that maintain sound health. We need mention no more than the frequently protracted convalescence from typhoid states, from the grippe, from common colds, from scarlet fever, diphtheria, measles, whooping cough, dysentery, and nervous shock, to call to mind an endless procession of illustrative cases.

A most important example is acute inflammation of the kidney. Neither time nor drug treatment can assure the patient that when the active inflammation ceases the normal kidney will be left and no chronic Bright's develop from lingering traces of the lesion. But there are methods of acting upon·the tissues with electric currents in such a manner that positive, *decisive* and prompt recovery of the normal state of the kidneys must take place. The risk then of chronic disease is removed. The patient is placed in safety. The haunting dread and life of slavery to "diet" is escaped.

More conspicuous still is the example of that common form of bronchitis which the laity neglect because it is "only a little cold on the chest." But it ends in the grave of the consumptive in far too many cases, or if that fate is not the lot of enough to serve as warning, the neglected cold returns every winter and becomes the "winter cough" which affects the last ten or fifteen years of thousands of people in our northern climates.

The almost unfailing and decisive means of re-establishing the soundness of the lungs and building up the tissue-resistance so that Nature will endure ordinary exposures, resides in electric currents and skilled methods of administration. Banish neglect of common colds and you will banish chronic bronchitis and consumption *absolutely.* The period of convalescence in these cases is more vital to the patient than the acute stage of the disease.

So, too, in many chronic cachexias—the inheritance of malaria, syphilis, suppurative absorption, toxæmias, etc.—after the active cause is removed vitalization of tissue is what these patients need. They need fortifying against toxic attack; and electrical stimulation of the nutritive processes of Nature easily accomplishes this desired end.

In infantile marasmus the long period of anxiety will be cut short by the nutritional assistance of electricity. In chlorotic conditions, the menstrual derangements of school girls, and the disturbances of boys through the period of puberty—a period in both sexes when the equilibrium of the nervous system can be immensely aided by electricity—the hygienic advice and the dietetic and drug prescriptions of the physician should never be left without the still more helpful treatment of physical remedies.

To the business man and the woman of important affairs nothing may be more taxing and costly than delayed recovery and rest from some exhausting period of strain, overwork and broken sleep. These states of acute mental and physical prostration occur daily and both Wall-street panics and political campaigns contribute to them. But at once, as a drink quenches thirst and as food stops hunger, so the tired nerves can be fed and refreshed by a tonic banquet of proper electricity. Were this competent restorative remedy employed as it should be in all such times of stress, there would be fewer wrecks along the pathway of business and social competition, and less remorse in after-life. When irritable exhaustion overtakes any one it is time to call in the quality and kind of rest that electricity so well supplies.

Still another phase of this subject is seen in the effects upon the human organism of the poison of *grief*. Grief and shock depress the nervous system and examples are familiar to all who have passed the meridian of life. Recovery may be as slow as convalescence from typhoid fever; occasionally a victim never is the same again. Eight years ago the sudden news of a lover's death shocked a young woman and she has been a neurasthenic invalid ever since. To-day she comes to us for the treatment she should have had at first.

From the medical standpoint these conditions are well considered in the following extract from the Medical Record:

> "Recent medical observations show that the physical results of depressing emotions are similar to those caused by bodily accidents, fatigue, chill, partial starvation, and loss of blood. Birds, moles, and dogs which apparently died in consequence of capture and from conditions which correspond in human beings to homesickness and "broken heart," were examined after death as to the condition of their internal organs, and it was found that the nutrition of the tissues had been interfered with, and that the substance proper of various vital organs had undergone the same kind of degeneration as that brought about by the germs of infectious disease.
>
> "To urge work, study, travel, and the vain search for amusements, is both useless and dangerous. For a time the whole organism is overthrown. Readjustment comes slowly. Sorrow, grief, and all great misfortunes should be regarded as conditions similar to acute infectious diseases, which they resemble in result, and, later, as convalescence from such diseases."

When these cases are left either to the solace of time or the sympathy of friends, or the influences of rest, diversion, etc., their capacity to benefit by voluntary effort is so impaired that persons naturally moody are slow to brighten. But aid them with the resources of electricity and the morbid mental state is more speedily restored to normal. No class of unfortunates is in greater need of the nerve-toning properties of selected electrical treatment; and the benefits of sunshine, diversion and rest will be more than doubled if we first prepare the patient by restoring the physiological functions with electricity.

We need not remind the reader of every phase of this important subject, for whenever any person feels below *par* and does not quickly regain the energy that belongs to his years and habits the tonic action of electricity should be sought. About a year ago a manufacturer was such a case. He had not been sick since boyhood; but he was thin, dark rings were under his eyes, and he did his work with difficulty. To improve himself he had stopped smoking, adopted the diet he believed rational, and was perfectly regular in his life and habits. At length he realized that his management of his extensive business demanded more mental vigor than he had and he was put in the way of getting it. In a month he had gained seven pounds, had energy in his face, managed his office affairs with renewed ease, and stopped treatment. Improvement, as usual, went on after treatment stopped and both his business and his family benefited by the change in him.

More women than men need the tonic up-lift of electrical energies and just here a hint may be gently given to those who need it. We hear much at times about the "divorce evil." The desire for divorce is the expression of a certain disappointment. "Incompatibility" is often the shrinking of sick nerves and tissues, or the irritability of jaded nerves, or, at least, the apathy of nerves that do not thrill with the animation of vigorous health. On both sides of the divorce court these things merge in just one cause, which cannot be put in plainer language here. But the wise who wish to avoid the infelicities of a cool consort may take a timely hint and possibly recall the atmosphere of the honeymoon by consulting the state of the tissues and their amenability to proper electrical treatment. For the pelvic conditions of women are 80 per cent. the functional derangements of causes which skilled electrotechnics can remove, and with treatment which is needed, advice which is heeded, and the disposition and desire to recover paradise, a happy conclusion will result in the majority of cases.

In the convalescence of the system from fright, mental panic and states of worry and suspense, there is no rival to electricity. When a man sees his business threatened with wreck, when he faces losses that spell ruin, when his every view of the future is through the bluest of glasses, when he carries his heart in his throat and the slightest turn of the market sends a knock-out blow to his solar plexus, the signs point to the fact that such a man needs electricity to tone him up. It can do it with an energy and promptness that will make him regret that he did not know it before. It is the nerve tonic *par excellence* of the materia medica.

# CHAPTER X.

## CERTAIN FUNCTIONAL DISEASES OF THE NERVOUS SYSTEM WHICH REQUIRE ELECTRICAL TREATMENT.

Showing that in the Neuroses of Modern Life Electricity is to the Nerves almost what Oxygen is to the Lungs.

In a systematic medical treatise for professional instruction we arrange diseases with reference to causes and tissues affected, but in this far briefer text we intend to give the reader practical information about the things he wants to know, and the rarer diseases do not interest the majority of average people. Electricity will do many things that lack of space compels us to omit from this small book.

But all Americans have "*nerves*." The fanciful journalist even styles the nervous tendency of our native stock, "American-*itis*," and owing to their prevalence and importance we shall begin our consideration of general diseases with those of the nervous system.

When the nervous system is *below par* or *out of order*, without any organic disease present, the physician has to deal with a *derangement of nervous functions.* When Pandora opened her box she let out a lot of them.

Now, however prolific of symptoms these "functional derangements" may be—and however obstinately they may resist drug prescribing—they constitute a great field in which the effects of medical electricity are most happy and most gratifying to the patient. Some of these functional nervous diseases have been given definite diagnostic names, but others cannot be so easily labelled; nor does it matter, for the principle of proper treatment is not determined by any name.

The principle of treatment is to ascertain the nature of the deviation from normal function and then select and apply the means of inducing the function to return to normal. The difficulty of doing this depends on a variety of conditions, but in the vast majority of cases electrical resources can be made to provide the sovereign remedy.

When these derangements are recent they are often speedily relieved by the function-regulating, sedative-tonic, alterative and nutritional actions of general electrification, assisted by such local uses of the proper currents as may be required to remove the local and reflex symptoms. In most of these cases we must treat the general health of the patient, for even the apparently robust who think themselves well can have an amount of nervous debility that needs a good deal of building up. It may be fairly said that no case of functional nervous disease of whatever variety is properly treated unless the competent administration of electricity is prescribed.

When Mrs. Blank with a lot of cares of any kind informs her latest caller that she is suffering from "nervous prostration" she means that she has the most widely distributed and protean form of irritable debility—to wit, *Neurasthenia.* It has been well said to constitute a whole family of functional disorders, and was regarded by the distinguished physician who first drew medical attention to it some forty years ago as "at once the most frequent, most interesting and most *neglected* disease of modern times." The majority of those who have it in a minor degree do not seem to be aware that a single month of treatment could save them a world of future trouble with their nerves.

Strictly speaking, neurasthenia is not a definite disease but a condition, and the group of symptoms in a given case may either be true functional conditions and therefore of a curable nature, or the symptoms may have their origin in some deep-seated, undiscovered, organic disease for which an entire cure may be difficult or impossible to find.

The state of partial, mild, or extreme, "nervous exhaustion" may be due to rapid or gradual causes—worry, over-tax, domestic trials, business suspense, lack of regular sleep, impaired nutrition, too long sustained excitement, too hurried eating, exertion too soon after or before eating a hearty meal, the mental wear of unsatisfied sexual desires, the sequelæ of acute disease, the laws of delay and any of the wearing, depressing, disappointments of harassing life. But however caused, the most rapidly curative measures of treatment are rational hygiene, medication as needed, and the skilled resources of electricity.

The so-called "rest cure" was popularized by Weir Mitchell long years before the modern resources of high-efficiency electrical apparatus entered the field of treatment. The lesser energies of massage and small faradic batteries of earlier days made it seem necessary to isolate the patient in bed, keep relatives out, pursue a day-long routine, and separate the unfortunate victim of such treatment from her family for months, often a full year or more.

But, to-day the patient can be aided to recover far more rapidly. She needs no sequestration from friends and the diversions of life. She can be treated in half an hour about three times a week and gain as much improvement usually in three months of agreeable and non-taxing office treatment as she formerly gained in the long, tedious, undecisive "rest cure."

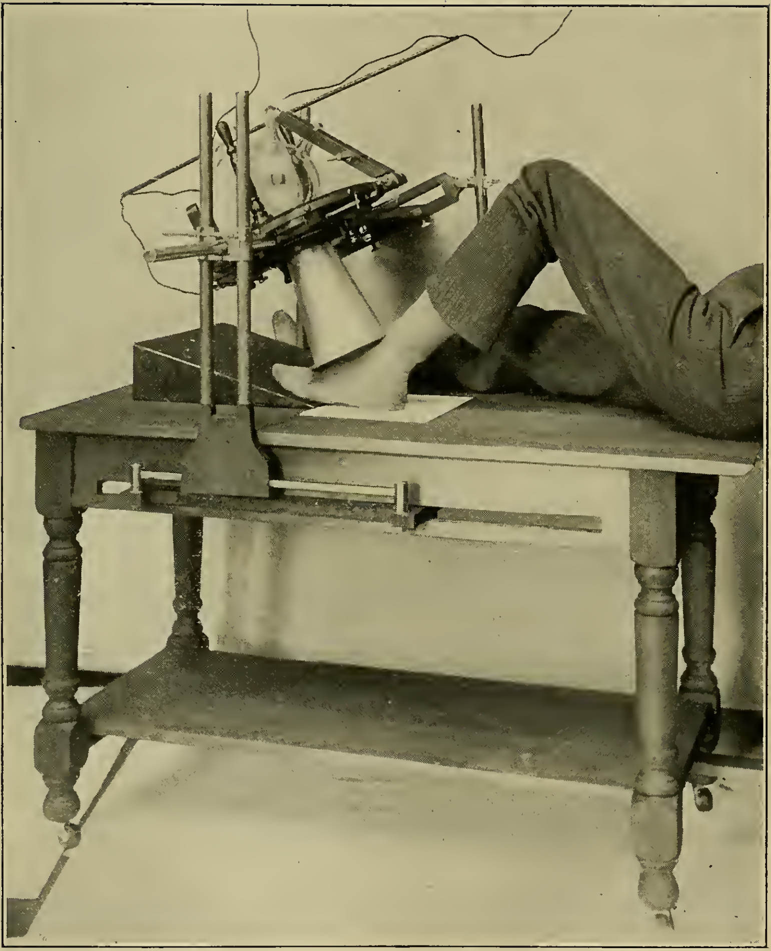
Treatment of nervous debilities with other measures—omitting electricity altogether—is not to be thought of. The patient who thinks she is "too nervous already" and that "electricity will make her more nervous" is as much in error as to the actions of proper electrical administrations as was the boy who broke his leg dodging his own shadow. The tranquillizing nerve food *par excellence* is sedative electricity. The whole treatment is a banquet of luxurious rest to the fretful nerves, and not seldom the patient goes to sleep during it; the tension relaxes, worries take wings and fly away, the "blues" depart, nature is composed and strengthened—the patient gradually gets well.

Before leaving the subject of neurasthenia it will be suggestive of the value of medical electricity to group for the reader the collected symptoms of the "most frequent and most neglected of modern diseases" so that we may know exactly what sort of a task its cure consists of. The remarkable list of symptoms of neurasthenia collected and made classical in the writings of Beard is as follows:

"Tenderness of the scalp; cerebral irritation; dilated pupils; sick headache and various forms of head pain; pain, pressure and heaviness in the head.

"Changes in the expression of the eye; congestion of the conjunctiva; disturbances of the nerves of special sense; weakness of the eyes, muscæ volitantes.

"Noises in the ears; weakness of the voice; deficient mental control; sense of hurry; tendency to work with over-haste; over-



A COMPRESSION DIAPHRAGM DEVICE RADIOGRAPHING AN ANKLE

The second essential for accurate X-Ray examinations is the instrument of precision illustrated here. Distortion is eliminated and scientific correctness in radiography is secured. A full account of the principles, uses, merits and technics of this superb instrument (some 10,000 words with numerous cuts) was published by the author in the Illustrated Review of Physiologic Therapeutics for April, 1904. It is a device of the greatest interest and value.

talkativeness; mental irritability; lack of composure; slight efforts cause fatigue.

"Hopelessness; morbid fears; timidity; easily startled; small worries loom large; feeling of panic on small occasion; flushing and fidgetiness; frequent blushing; nervous movements of the face and eyes; cannot keep still.

"Impaired sleep; bad dreams; insomnia; drowsiness; sleep does not rest.

"Tenderness of the teeth and gums; nervous dyspepsia, flatulence; desire for stimulants and narcotics; deficient thirst and capacity for assimilating fluids; dryness of the skin, abnormalities of the secretions; abnormal dryness of the joints, mucous membranes, etc.; sweating hands and feet; sweating of the head; salivation.

"Tenderness of the spine; spinal irritation; irritability of the whole body; coccyodynia; peculiarities of pain in the back; heaviness of the loins and limbs; shooting pains simulating those of ataxy; pains in the feet; tremulous or variable pulse; palpitation of the heart; local spasms of muscles; tremors.

"Dysphagia (difficulty in swallowing); convulsive movements, especially on going to sleep; cramps; sensitiveness to weather changes; sensitiveness to hot or cold water; sensitive to sun heat and winter cold.

"Localized numbness, tinglings and hyper-sensitiveness of the surface of the body; ticklishness; profound exhaustion after exertion; vague pains and flying neuralgias.

"General or local itching; general or local chills and flashes of heat; cold hands and feet; nervous chills; sudden failure of general or special functions; temporary paralysis; gaping and yawning.

"Diseases of men (involuntary emissions, partial or complete impotence, irritability of the prostatic urethra); diseases of women; oxalates, urates, phosphates, and spermatozoa in the urine, rapid decay and irregularities of the teeth."

Divested of many technical terms and cut to half its length this is the partial symptomatic range of neurasthenia. But no one person has all the above derangements. Yet some have others not cited here.

Independent of the muscular achings, pains, headaches, sleeplessness, dyspepsia, nervous irritability, and other symptoms with which these patients are affected we find that many women and girls have "crying spells" with very small provocation and cannot control the tears. It is a very mortifying infirmity to the patient and she may not be aware that electricity is an efficient remedy. But it is. In cases of this kind it is the only thing to consider.

Also, either about the time of an approaching period, or when subjected to some social or domestic strain, a woman may feel "all nerves," and as if she must "fly," while if she is already neurasthenic and jaded she may feel desperate enough "to run away and never return." This unwarranted feeling is simply evidence of a neurasthenic state and can be quickly relieved by tonic and soothing electrical treatment.

If such a patient is in ordinary health a single administration of the selected current and methods may suffice her for another month, or until she gets out of sorts again. If she is worn out with household cares a couple of months of regular and frequent treatment will cost her husband a good deal less than a sea voyage and do her more lasting good.

The treatment of "*hysteria*" has also enlisted the full resources of the physician and sometimes has nearly exhausted medical patience. Very bad advice has been given to the family of the victim when a particularly trying case has reached the limit of tolerance. But the records of such treatment belong to a past. With modern electro-therapeutic resources the records tell a different story.

But, the layman may ask, "What is Hysteria, of which we hear so much?" It is not a mere whim nor a petulant temper, and it demands genuine treatment.

Hysteria is a functional disease of the nervous system, characterized by a morbid susceptibility to mental emotions without will-power sufficient to control them. It also involves sympathetic nervous phenomena. There is frequently some undoubted relation between hysteria and uterine and ovarian disturbances. Violent mental phenomena arising from grief, disappointment, anger, fright, suspense, etc., are among the factors of causation.

There are three indications for electricity: The improvement of the patient's general health, the relief of symptoms, and a gradual cure. In cases with paralysis, aphonia, ovarian pains, backaches, joint pains, curious sensations, and all the vagaries which this neurosis can present in its strange simulation of other diseases, the resources of the different electric currents are the sheet-anchor of curative treatment. Drugs for this condition often lead down hill instead of up. A patient may take a score of prescriptions and be a hysterical trial to herself and family for ten years and get well in three months under proper treatment with electricity.

*Hypochondriasis*—in common parlance, the "hypos"—is one of the morbid mental states from which the melancholly victim can be rescued by electricity. Men and women too seldom seek treatment for unhappy mental states and yet they are mainly the reflex of removable physical ills and are so prolific of misery that neglect accounts for more than ninety per cent of our suicides—suicide being inconceivable except upon the ground of temporary mental aberration or as an escape from unendurable suffering. In ordinary cases reported in the press it seems to the physician that a couple of active eliminative-alterative-tonic treatments with the great resources of electrical energies would have cleared the mind enough to prevent the fatal step. But short of these, our streets are full of people who could be helped to better spirits and improved functions of the brain cells and nerve centres by electricity. The shame is, they do not know it.

It is important to consider these minor mental derangements a little. Their depression of the average happiness is not enough realized. In confusion of the mind, impaired memory, vertigo, hypochondriasis, and the simple forms of mental derangements that result from irritants in the circulation or imperfect nutrition of the brain, the action of selected technique will make electrical resources the chief restorative agency—in recent cases, swift, certain and of lasting value. Insanity is often the result of physical causes, and some degree of physical ill-health usually complicates or causes the departure of the mind from normal action.

The majority of recent cases of impaired mental functionation have either insomnia, or active brain excitement, or mental torpor, or morbid motor activity, or the reverse, as part of their symptoms at one time. Almost every state of disease affects the mind secondarily, and every one is familiar with the effect of a torpid liver upon the head. Actual insanity is an appalling horror, far too much neglected in its incipient stage when an ounce of treatment is worth a pound of later regret.

Before the doors of the asylum open to receive the patient—long before the asylum becomes necessary—there should be an earlier effort made to balance the nutrition of the body cells, to regulate the nervous energy, to unload the portal circulation and the liver, to exercise the muscles and subordinate centres so as to provide physiological and safe outlets for the emotions, increase self-control, abolish worries, promote sleep, composure and normal digestion, and occupy the mind in a happier way—and in many cases electrical resources can do these things.

When a person is unable to think clearly or continuously upon business or other necessary matters, is unable to fix the attention or control the memory, and when the faculties are either dull and sluggish on the one hand or restless and over-active on the other, these indicate the immediate need of the corrective, eliminative, refreshing and restorative action of some of the efficient resources of electric currents, light rays, etc.

When disturbing mental states are dependent on some physical disease of a curable nature, and more especially if they are the mere sequence of worry, over-work, excitement, grief, shock or alarm, or long-continued loss of sleep, the beneficial action of electricity is like oil on troubled waters. There is nothing equal to it to clear up the mind, brush away the cobwebs, and reinvigorate and re-establish the normal workings of the system.

We at times hear of "Don't Worry Clubs," and disquisitions in the popular press treat the matter of *worry* as if it was entirely under the control of the individual. The greatest don't-worry club in the world is an alterative-tonic electric-light bath followed by suitable after-treatment with high-potential sedative-tonic electricity. Unhelped in this manner the resisting power of the mind is as unable to shed worry as a blotting-paper is unable to shed ink.

But if we eliminate toxic products and release the tissues from depression, and then rouse up the functions and brain cells, there is no further lack of ability to laugh at worry and to face the world with cheerful determination. The chatter of by-standers advising distracted people not to "worry" is unexcelled in uselessness by any device we know of; but electricity displaces the need of words and gives the patient command of a courageous mind. It is worth a lot.

If, in states of great depression, the memory is so weakened as to be almost lost, and the mind is so debilitated that even the mere thought of performing a simple act sets the patient in a tremor, we have seen four to six weeks of regular treatment with electricity, nourishing food and iron restore a sturdiness of mental and physical vigor unknown for years.

Even in the true insanities a number of progressive institutions report from time to time in medical journals and in correspondence a very decided help from electricity in abating symptoms, improving the patient, assisting actual recovery and in some cases producing permanently restored health. In one of our large text-books we cite a variety of cases in which electricity aided in the treatment.

The value of one form of electricity in these cases, as in many others, is greatly enhanced and made practical by its exceptional facility of administration. This form is Static electricity. Its four varieties of employment cover a hundred or more diversities of dose and technic, and many of the platform methods can be utilized with little or no removal of clothing. For many reasons and for many patients this is the thing that makes treatment possible at all. The high-potential current passes through the clothing and we secure the proper dosage by certain regulation of the resistance in the circuit.

*In closing this chapter we may mention, and we speak from repeated experience, that in taxing literary work, such as writing two, four or six hundred thousand words of text amid countless interruptions and other demands on one pair of busy hands, no other agent can do so much to sustain the tired author and carry him through the task.*

Just a word here on one very important point: Many men and women read about the uses of electricity in medicine, or some friend reports the results of treatment, and yet no impression of genuine, substantial medical *work* is made upon the mind. An airy scepticism is cultivated, as if it were a sign of superior acumen to assert, without knowing the truth, a supercilious dis*belief* in everything pertaining to medical electricity. It is hard to imagine a reasonable ground for this attitude toward the greatest of non-drug medical agents, but some part of the explanation may be as follows:

When patients remark that their relief was "wonderful," or "miraculous," or "the most marvellous thing they ever heard of," or, "it was almost like magic," or, "it was the most delightful sensation I ever experienced," and report immediate benefits from a few electrical treatments after months or even years of suffering and the failure of other measures, it is likely that the casual reader or listener seizes the word "magic," thinks of Aladdin's Lamp, and possibly conjures up a wholly fanciful picture of "magic arts" and the Magician's Wand as the idea of an electrical treatment.

Belief in the cure of neuralgia, lumbago, sciatica, headache, paralysis, diabetes, bronchitis, hay fever, etc., by any such *hocus pocus* is impossible. With the utterly worthless toy, the cheap family faradic battery, in the mind's eye, while the outer eye rests upon only the printed words, it is indeed hard to connect them together. And they do not belong together. They are as far apart as the baby's rattle is from the switchboard of the telephone exchange. They have no more relation with each other than has the child's tin wagon with the Empire State Express.

For the great clinical results of skilled medical treatment are accomplished by *work*—work that has its foundation in four years of medical education before a patient is treated, that involves the later development of other years of technical training in methods, dosage, and the mastery of competent tools; work that requires laborious toil, patience, finesse, ingenuity, continuous research, a never-tiring devotion to the strife for improvement, an endless outlay of money for the latest and most up-to-date apparatus. The public should not overlook these things—*the basis of scientific electrical treatment.*

For difficult and exquisitely careful *work* is back of the curative results of medical electricity—not the imagined flummery of magic. But physicians do not magnify their work when they write or talk. The public reads of a critical surgical operation but they do not know of the hours of work spent over the patient to make the result a success; often work that wears on the assistants night and day until convalescence is established.

We are accustomed to easily say that "engineering skill" built the Brooklyn bridge. But who to-day recalls the years of labor on the plans and the specifications, in tentative tests of new and untried devices, in the correction of mistakes, in the construction of tools—work the public never saw, but without which the great bridge would never have spanned the river. Exactly the same principle applies to the brilliant and often wonderful achievements of medical electricity. Work and yet more work, scores of hours of work that the patient never sees, work during treatment and before and after it, is the only road to the results the patient calls for.

# CHAPTER XI.

## PAIN: SLEEPLESSNESS: HEADACHES: AND BRAIN FAG.

The Control of Electricity Over These Conditions. An Account of Its Usefulness to Those Who Need Its Sedative-Tonic-Restorative Properties.

PAIN has but one rival in the concern of the sick and that is hemorrhage. But some time in life every one has pain—toothache or corns if nothing else—while hemorrhages are few: but over both pain and the hemorrhage of disease electricity exerts a controlling and curative action greater than any other remedy in the materia medica.

The study of the cure of pain is one of the most interesting things in electro-therapeutics and is altogether a different matter from obtunding the symptom with a narcotic. Electric currents in some form and by a dosage and technic to suit the case will temporarily comfort almost any pain that can attack the living tissues. This immediate relief will be followed by permanent relief in a very large class of cases, if reasonable treatment is persisted in.

In some simple and recent though severe pains one administration suffices. In others, a varying number of treatments will gradually lengthen the intervals between the recurrence of the attack and finally result in a permanent cure. In the small but often intense class of pains resulting from incurable disease the sufferings can be greatly reduced if not entirely removed by skilled electrical palliation.

Electricity does not threaten the heart and impair vitality. It does not upset the stomach and impair digestion. *And when any form of electrical energy will relieve any form of tenderness or pain it possesses the enormous advantage over morphine, antipyrin, and other drug anodynes, that, at the same time it is giving either short or long-lasting relief, it is also imparting a general nutritional benefit.* In chronic diseases this benefit is of great importance.

The pains that require surgical operation for their removal, and the conditions of acute disease, are exempt from the above remarks in ordinary practice.

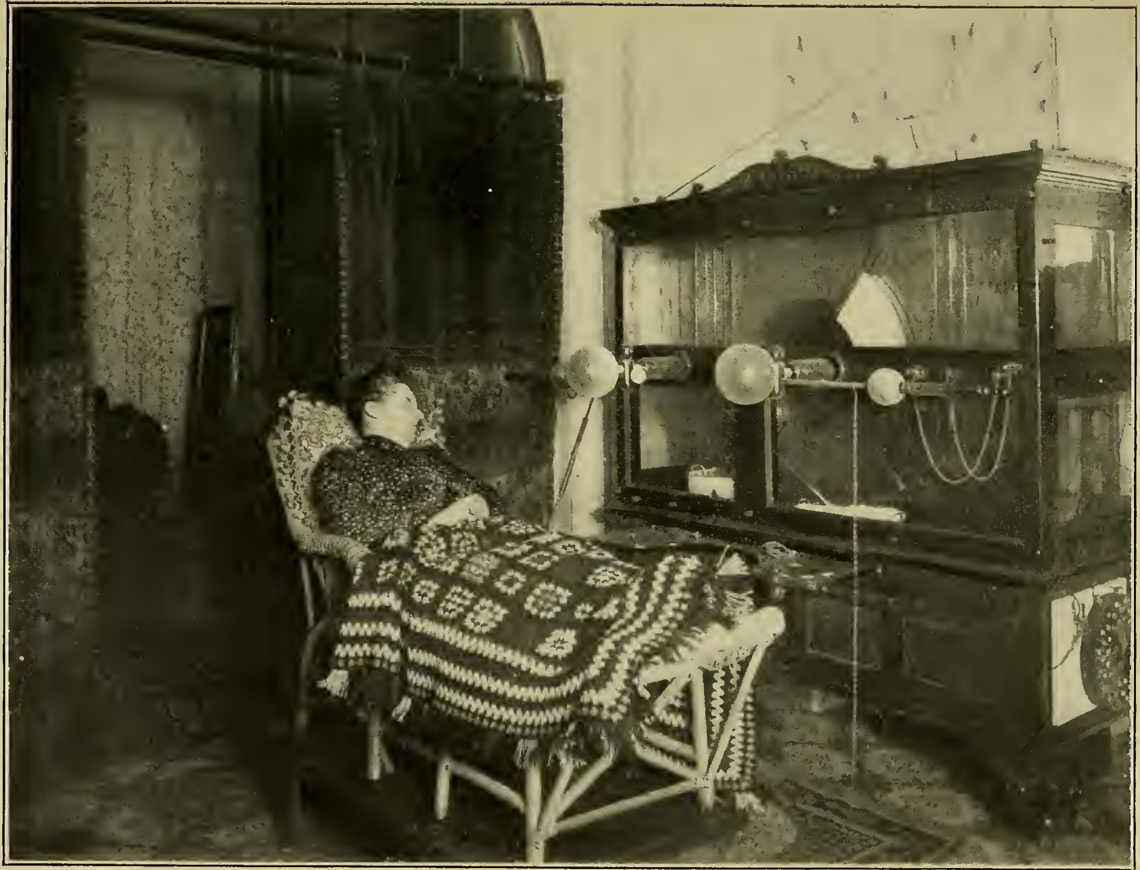
If a given patient suffers from severe pains of any part of the body and the cause cannot speedily be diagnosed, the action of electricity will often aid to clear the diagnosis as well as to afford relief. It helps us to distinguish in doubtful cases between functional and organic disease, the one curable nearly always and the other seldom curable in an advanced stage.

Sometimes a pain persists after the exciting cause abates or is removed, and these are especially amenable to electricity. Sometimes the cause cannot be reached and yet we can ease or so modify the pain that it gives little trouble. But while the exciting cause is active the pain usually returns after treatment until the conditions abate. An illustration of this principle was seen in the following case:

A woman attending the author's clinic complained of an acute pain in her ear. Examination showed no signs of cause. A sedative application of electricity stopped the pain, but in a few hours it returned. It was again relieved and again returned. By this time a furuncle had developed and explained why the current failed to give more than temporary comfort.

Of the different types of current each has a field in which it is superior, but all varieties of current can be made to exert a soothing action upon painful states, and the trained physician has certain indications which guide him to the choice. Yet, the failure of a simple point of technique may cause the patient disappointment. For example: a young lady suffered from a neuralgic pain on the under side of her third toe joint. Disturbance of circulation and temperature of the foot were also annoying. Her physician knew that electricity ought to entirely relieve her but his attempts failed, so he sent her to the author. With the same apparatus but with the simple difference of a round contact pressing closely into the tissues instead of her own physician's flat electrode we removed the pain, warmed the foot, and sent her home comfortable. Three treatments made the cure permanent. It is not enough to get the proper dosage of current *near* the affected nerve: it must be passed directly through it in some of these particular cases.

Injuries and surgical operations sometimes leave long-lingering pains that only the resources of electrical energies can remove. Some three years ago an elderly gentleman had a tumor cut from



ONE OF THE AUTHOR'S "REST CURE" METHODS

This siesta in an insulated couch is one of the agreeable and effective means of benefiting a nervous patient with static electricity. To be highly efficient it requires an active generation of current, the machine illustrated having sixteen revolving plates, each thirty-two inches in diameter and operated by a ¼ h.-p. electric motor. A nap of fifteen minutes while thus subjected to a general electrification is more restful than a long sleep in the ordinary way.

the right thorax. Severe and almost constant pain and a sense of great heaviness had prevented sleep and impaired his appetite and nutrition, leaving him cachectic and disabled. Other treatment failed to give relief. With three definite indications for electricity the first treatment gave relief for a few hours; the second relief lasted for a day; the third found him gaining in strength, appetite and ability to sleep, and when the pain returned it was less severe. In less than a month this chronic suffering of three years was changed to vigorous comfort by electricity.

Sometimes a nerve injury appears to be very difficult to cure when the opposite is the case. A business man on a summer vacation was climbing a "mountain" and fell. To save himself he put out his arm and his bent elbow struck on a small stone and chipped off a sliver of the olecranon process—the so-called funny bone. For fifteen years he suffered from neuralgic pains in this elbow tip. He had occasional treatment—some of it with electricity—without any lasting benefit. But a flat electrode would not make genuine contact with the tissues in the depressed groove of the bone, and ordinary applications failed. When we placed a suitable means of contact in the groove and got a sedative application of current directly through the irritable nerve filament the pain left. It did not come back at all. The cure was easy. It was only a question of *contact*, at times the paramount factor in electrical technique.

Even the sufferings of cancer find their best palliation in the pain-relieving properties of the various electrical resources, and the same is true of locomotor ataxia and the degenerations of the spinal cord.

And so it comes about that the troublesome symptoms that *hurt* bring more patients to the physician's office for the comfort of electrical soothing than almost any other reasons combined, for too many people think they are not sick until they suffer. This fallacy often prevents them from getting well.

But *Insomnia*—the inability to sleep—is also a very troublesome symptom, and one which no one should neglect. Adequate and refreshing sleep is necessary to good health. There is no substitute for sleep and the art of medicine cannot supply its lack.

Various forms of electricity improve the ability to sleep by relieving symptoms on which the insomnia depends, and by promoting nutrition in general. Sometimes the patient falls asleep during the administration of electricity, and this is a very common occurrence in the use of high potential currents and may also happen with both the constant galvanic and the rapidly interrupted and fine coil faradic. We say this because we have seen it happen in our own practice very many times—it happened to-day, and yesterday, and the day before.

The only proper use for drugs to assist sleep—the insidious drugs that are called "hypnotics"—is in acute and temporary emergencies. In chronic states dependency on drugs is dangerous, depressing, and has too often been fatal; but the resources of electricity are effective, harmless, and up-building. From among its command of a hundred methods of treatment at least one can be adapted to the needs of almost any case if the patient desires cure and if the cause of the wakefulness can be ascertained and reached.

When disordered sleep is due to a disordered liver and stomach we cannot quickly correct these several functions with any one agent alone. The combined aid of diet, judicious eating, medical prescribing and electrical resources are required for the best results. It is surprising how slight a gastric derangement—unnoticeable in any other way—will keep a man or woman awake two or three hours when they ought to sleep. And one of the most rebellious cases of insomnia met in our experience was a man who was trying to stop smoking. Many do it with more or less difficulty. But he declared that he could not *finish* the job at all, but always had to go back to his cigar every time he tried to stop. He could not sleep without it. Whether he really wanted to stop or not is uncertain, but for about two weeks he thought he wanted to. Electricity did not help him.

When, however, the want of sleep is the expression of a purely nervous and irritable state of the system electricity becomes the remedy of first choice. The power of sedative-tonic applications in restless states to tranquillize the central nervous system, equalize the circulation and restore the *capacity to rest* makes it the best remedy at our command. In neurasthenic insomnia, the wakefulness of mental exhaustion, of nervous irritability, of worry, suspense, anxiety, and the feverish haste of fatigue, electricity is nature's true remedy and is indispensable. It is the prince of remedies because it at once treats both the disease and the patient. It attacks the symptom and imparts a constitutional benefit at the same time.

We recall many such cases: one of them, a gentleman who had slept very poorly for five years and whose nervous irritability was so great that his business associates could hardly talk with him five minutes at a time. His ability to sleep began to improve after the second treatment and within three weeks he was procuring full, sound, refreshing sleep every night.

Of the great services which skilfully employed electrical resources can render in the hour of extreme need to the victim of a shattered mind it is impossible to speak too forcefully. Every now and again some case of complete nervous bankruptcy comes prominently before the public by reason of the distinguished character of the victim. It may be an editor who has ruled supreme in the affairs of a great newspaper for a quarter of a century (like Greeley), or a novelist who (like Scott) has over-taxed his mind, or a popular preacher or ambitious business man, who, burning the candle at both ends, finds himself suddenly on the verge of a break-down—unable to sleep or rest of his own volition. An item of the daily press presents a typical case:

> "General ———, who has been prostrated for the past few days with a severe attack of neurasthenia, was no better this morning. The General complains for the past fortnight that he has had hardly any sleep except what has been induced by occasional doses of morphine, which, however, his physician would not allow him to have often. 'I spend the greater part of the night,' said the General, 'walking up and down the floor here. I feel utterly worn out and fear the worst consequences of my illness. The most distressing symptom is this horrible restlessness and insomnia. I also suffer from severe pains in the forehead and I find that I cannot keep my attention fixed on a book or anything else for any length of time. I cannot describe the utter despondency I feel. My doctor advises me not to lie abed all day but go out for a drive occasionally, which I sometimes force myself to do. He often advises me not to make myself miserable about my condition, but that is easily said.'"

The condition so well described is a trumpet call for sedative-tonic electricity. Not to use it is malpractice. The physician who withholds from such a patient in his extremity the best resource that medical science contains fails in his duty. It is not enough to prescribe morphine and tell him not to worry. In these acute cerebral exhaustions there is little will-power left to command self-control. "As well," said Sir Walter Scott to his physician, "put a kettle of water on a red hot stove and tell it not to boil as to tell me to stop thinking." If we remember rightly, Faraday broke down in the same way.

In contrast, we are treating another case of insomnia, but this has for its cause the disturbing cough and oppression of breathing of a chronic bronchitis existing for fifteen years. It is complicated also by a hernia, and by a low grade of cystitis. The patient, a man of sixty, declares that he has not been able to get more than two or three hours sleep at night for ten years. He is haggard enough to confirm this statement. And electricity has built up his sleeping capacity to seven hours a night. And in just a month to a day. It has attacked the chest condition and improved it until respiration is nearly normal. It has, with the aid of a single medical prescription, relieved the intense pain of urination and restored the flow. It has energized his muscles so that he can work. It has given him an appetite such as he has not had in many years. His face is rugged and ruddy. No common "medical family battery" on sale in supply store windows does work of this kind. But the full resources of high-efficiency apparatus contain the means of commanding such results, and many like them.

The owner of a *headache* usually ignores the fact that it is a symptom of some local or constitutional derangement and not a distinct disease. But before the medical prescriber can answer the question, "What is good for a headache?" he must first find out what kind of a headache it is; for unfortunately there are more head-pains than one. A physician has made an alphabetical list of thirty-nine forms of headache, with the remedies usually prescribed for them—two hundred and fifty remedies without mention of electricity.

Few drugs given for the relief of the pain are directly curative, and some are paralyzers of the heart and some destroy the red blood corpuscles. The coal-tar "headache powders" sold by the million are doing much to undermine the health of those who take them frequently. But when *electricity* removes pain it also builds up the forces of nutrition and general health. The combined resources of electric currents are *supreme* in the treatment of almost all forms and intensities of head pains, except the sick headache of gastric disorder (the cure of which must correct the stomach) and the pains of pressure within the cranium.

We have seen congestive and nervous headaches which had lasted with great severity for many hours disappear for the time being in one or two minutes after the action of the current was begun. We have seen a severe frontal headache in a woman who was subject to frequent attacks remain free for three weeks after a single treatment. An intense pain over the right eye lasting all day in the case of a gentleman subject to occasional attacks, was relieved in one minute and did not return during the year that we kept track of this case.

Almost all the cases of chronic disease that attend the physician's office bring headaches at some time or other and leave them behind. The most common thing in the use of medical electricity is the removal of headache—and in such a way as to leave the system normal and not "doped" with a depressant. Long-lasting relief is the rule, but some forms of pain return and for curative effects require persistent and regular treatment. The headache that it takes ten minutes to remove is exceptionally obstinate.

The local treatment and temporary relief of pain in the head is, however, the least concern of the physician, and a permanent cure is often a different matter. The symptom is often an accompaniment of derangements or disease elsewhere in the body and with the improvement in the causative condition the intervals between the headache attacks become greatly lengthened.

The headaches of rheumatism, gout, malaria, diabetes, neurasthenia, syphilis, anæmia, nervous dyspepsia, etc., gradually undergo improvement while the main disease is being treated. The famous "uric-acid diathesis" is the sponsor for many headaches and the prince of curative agents is always to be found among the many weapons in the arsenal of electric currents. We shall see *why* when we take up the subject of rheumatism and goutiness a little later.

When a man does thirty-six hours of head work every twenty-four hours of the day and keeps at it long enough he acquires the condition known to physicians as "*Brain-fag.*" The term is expressive and signifies exactly what is the matter. The brain cells are *fagged out.* They revolt at further work until their stock of vitality is replenished. Acute brain fag is the result of brief high-pressure mental over-tax, but the chronic condition comes on slowly and in lesser degree in teachers, preachers, professional men and women, students and all who burn the candle at both ends of the wick. Sometimes the victim is an over-taxed officer of the government, a great Secretary of State, or even the Executive himself. The present incumbent betrays his neurasthenia by unmistakable signs.

No class of patients are more sadly wronged by wrong medical advice, for it is the mistaken custom of consultants of the very greatest prominence to refer these cases to "time and rest." Irony can go no further than to tell a man to rest when he cannot rest—when his nerve cells are irritable with the toxic products of fatigue which we must eliminate before we can re-establish the state of normal rest. Far better is the swift and sure action of electricity. Seek its aid before the final break-down occurs and there will be no break-down.

It is not the mere over-work that spells ruin to the health: it is the lack of three things during the siege of work—elimination of the rapidly formed products of waste (toxæmic poisons), restorative nutrition, and sleep. All these three are subject to the control of resources within the scope of electricity in master hands. Renown in the field of diagnosis, or surgery, or any narrow branch of practice does not excuse any physician—ignorance is no excuse in the law—for remaining ignorant of what these patients need.

After the catastrophe has occurred the recovery is a more difficult matter and electricity is still more indispensable, if that is possible, for absolutely nothing else in the ken of man will restore the elasticity of the exhausted mind. Years may gloss over the condition, but the man's capacity to work does not come back under any form of stimulus save the vitalizing stimulus of electrical energies.

Many a distinguished and brain-fagged clergyman, lawyer, statesman, financial genius and business manager would profit beyond calculation by this remedy. We have in mind as we write these lines two notable instances of break-downs in fashionable New York pulpits, with reports of unsettled reason, and an after history of long travel in search of rest and health with only partial success. One of the brilliant clergymen wrecked himself upon the shoals of alcoholic stimulation and his rescue cost his friends three years of anxiety. The other was urged to seek proper electrical treatment, but his family physician refused him the aid of both drugs and tonic electricity and insisted that he should *rest.* The unfortunate man—doubly unfortunate in his doctor—retired to a country village and after two years of unaided "rest" was scarcely able to stand in his own pulpit to accept the congratulations of his congregation.

With about three treatments a week for three months before the complete wreckage of this case the recuperative powers of nature could have been aroused so that genuine restorative rest and the return of normal vigor would have been the result.

If any reader thinks that this is an extreme claim for electricity we venture to assure him that it is well within the facts of our own work—work done with our own hands and based upon actions of electrical energies which can be demonstrated every day. Our clinical records are filled with scores of cases so much more remarkable than any results we shall mention in this brief book that the above examples are very moderate statements. Their chief importance lies in the fact that so few people know the things of daily demonstration in electro-therapeutics—and they ought to be far better known.

# CHAPTER XII.

## SCIATICA AND THE GREAT NEURALGIAS AND THEIR CURE.

Showing the Indispensability of Electrical Methods in the Curative Treatment of All Forms of Idiopathic Neuralgia, and the Reasons Why.

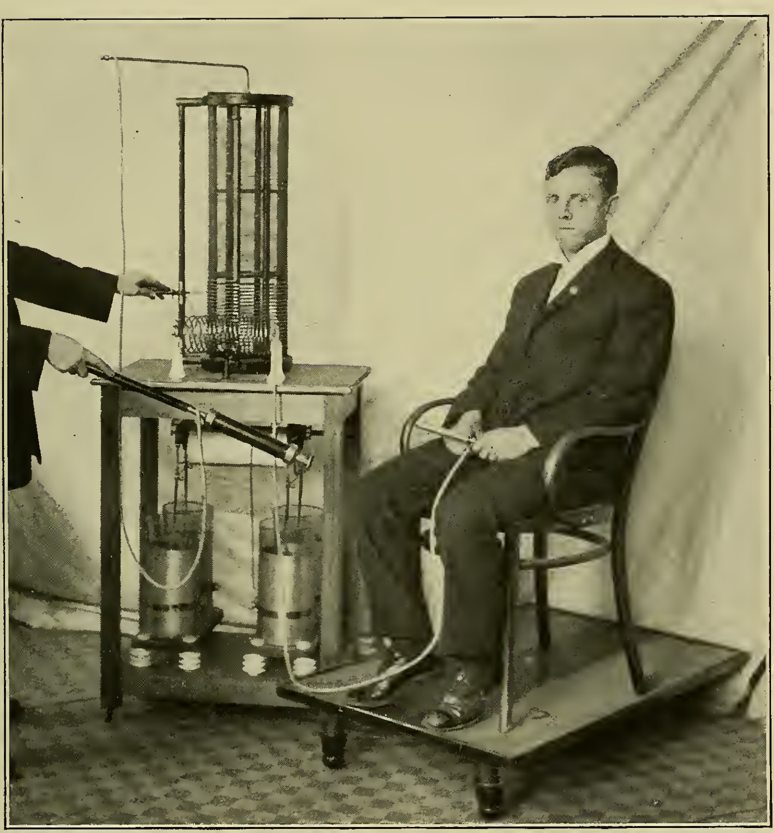
*Neuralgia* means nerve-pain, and in fancy in its simplest form this pain is the "cry of the nerve for food." This implies that in all cases of neuralgia the nutrition of the nerve is below par. This again means that electricity is the most active agent in aiding other nerve foods to act their part in feeding the filaments and anæmic cells. And for a century it has been the remedy in chief with all who are trained in its employment.

A celebrated physician of Vienna, chief of one of the largest clinics, has published a concise statement in regard to neuralgia, which very nearly represents the exact truth with those who are equipped with competent apparatus:

> "So nearly certain is electricity in some form to relieve an idiopathic neuralgia that if proper electro-therapy fails time will usually show a severe pathological condition to exist in the vicinity of the nerves—as, for instance, a tumor, an abscess, or some severe bodily ailment, as diabetes."

"Sciatica" is the most frequent and most important of the neuralgias below the neck. It may owe its origin to any one of a dozen causes; and fifty, nay, a hundred different remedies are prescribed for it. Sometimes a single medical prescription suffices; sometimes a successful treatment is found after twenty have been tried; sometimes no remedy avails and the patient relapses with the seasons for years, or the remainder of life.

But the man or woman who has sciatica wants relief, wants it urgently, and can usually get it from among the manifold resources of electric currents—and in these we include light-rays, vibration, high-frequency methods, galvanic and static currents, and everything else in modern electro-therapy.



A REMOTE COUSIN TO THE "FAMILY MEDICAL BATTERY."

From the low efficiency of the cheap toy sold as a "family battery" to this resonator and the high-frequency spray electrode illustrated here is a long step. The greatly increased value of modern electro-therapeutics over the past is due to improvements in generators of many phases of current and the adaptation of technics to the meeting of indications.

And right here let us urge one important point conveyed in the title to this chapter: no treatment except *curative* treatment is proper treatment of neuralgia. The use of morphine, codeine, acetanilid, antipyrin, and other anodyne destroyers of the nervous system merely for the comfort of the hour is absolute folly. Palliative relief from neuralgias—especially the ovarian neuralgias and those of the "fifth-pair," the great tri-facial nerve in the head—has led more people into the deadly use of opiates than any other single cause in medical experience. And it is not necessary to accept mere palliation. A rational and persistent effort to secure the nerve stamina and tone of normal health will usually obtain it through the assistance of suitable physical remedies contained in the score of resources of electrical energies.

Owing to the different causes and character of pain in the region of the sciatic nerve—the great trunk and its branches concerning the entire leg from the pelvis to the foot—the prognosis of treatment cannot always be stated in advance. Neuralgia, neuritis, muscular rheumatism, articular rheumatism, the effects of injury, pressure upon nerve filaments and pains arising from tumors or displacements within the pelvis are indiscriminately grouped by the public as *sciatica.*

Some of the causes of these pains cannot be reached by electricity or by drugs or by a surgical operation, but these cases are rare. One such in our experience proved to be a growing cancer of the rectum. Another seemed to be the secondary result of an operation which left a formidable scar in which nerve filaments were apparently compressed, the pressure causing the pain. Both of these cases obtained marked relief but not a permanent cure.

If the full resources of electrically operated apparatus—the modern arsenal of therapeutic weapons—are employed with competent skill they will be found to more than take the place of all the following remedies recommended in medical books: aconite, arsenic, ammonia muriate, atropine, the "coal-tar" analgesics, iodide of posassium, belladonna, turpentine, cimicifuga, salicylate of soda, rhus toxicodendron, iron, quinine, opium, phosphorus, sulphur, colocynth, etc.; hypodermic injections of morphine, chloroform, ether, antipyrin, hot water; sprays of chlorides of methyl and ether; massage, acupuncture, blisters, cautery applications, poultices, heat, cold, liniments, ointments, counter-irritants, Turkish baths, the rest cure, nerve stretching, excision of the nerve, etc. Electricity can be made to surpass all of them.

When sciatica was treated two generations ago with galvanic and faradic currents the results were not so decisive as they are now. Two opinions hold in the medical profession regarding Static treatment—one, that it is most competent to improve the greatest number of cases; the other, that it most often fails. The personal equation—the man behind the gun—explains the majority of its failures; for unless technique and the form of administration and dosage include the methods of regulating dosage for definite effects and of "posturing" the tissues taught by the author, the necessary actions of the current within the tissues will not be set up and the full benefit will not be obtained.

But when static electricity is well-handled the effect upon the irritable nerve is anodyne and the pain ceases to be felt; upon the muscle tissue the effect is tonic and the limb gains strength; and in from five to fifteen minutes the patient is usually free from suffering and able to walk with energy and comfort for the time being. The impression made upon sciatica by this agent is decisive, unmistakable and gradually curative.

Relief from the first treatment may last but a short time, after which the pain returns but usually with its severity lessened. Relief from the second static treatment lasts a little longer, and so on until relief is permanent so far as the given attack is concerned. Six, ten, or twenty treatments may be required, and if the case is not neglected but seeks treatment within a week of the onset of the pain the fewest number of applications will suffice.

Since the introduction of High-Frequency currents to medicine and the additional resources of electric-light rays and radiant heat we find that some of the exceedingly difficult cases that formerly baffled cure are now amenable to methods that supplement electrical resources more familiar to the laity. And it is important to control a great variety of curative resources in these cases.

A few months ago a young woman left off a warm petticoat and went out on a sharp winter day. Her fur jacket stopped its protection just at the exit of the nerve from the sacro-sciatic notch of the pelvis, and from the exposure she developed a severe sciatica. The usual time was wasted on liniments—which might as well be rubbed on a lamp-post, and she then hobbled in for proper treatment. It proved to be an obstinate case. Static gave only partial relief, and it is the rule in practice completely to allay all pain if possible before letting the patient go. Vibration added a little to the relief.

But when the tissues were placed under the comforting beams of warm "sunshine" from a 500 c. p. electric light the nerve made its last protest and surrendered. She walked freely and without pain. Was able to "run to catch her car" and reported two weeks later that only a few lingering grumbles had returned. The single session of *work* done upon the tissues restored them to normal and she has had no sciatica since. On the other hand, if she had let it become chronic by neglect the tissues would have undergone changes that ten treatments could not so easily have removed.

When the case is complicated by rheumatism or gout, or any other disease which benefits by such physiological actions as electricity can command, this agent steps in to save the patient from taking medicines which upset the stomach, impoverish the blood and tend to depress the heart. And still further to its credit is its rescue of patients from the morphine habit.

Cases of sciatica in which the pain is fixed in one locality and made worse by movement are most rapidly and brilliantly restored to comfort by selected electrical methods. Lancinating, sharp, darting pains, which come and go regardless of external circumstances, usually indicate a different condition which the physician will recognize and make a more guarded prognosis.

Inveterate and obstinate neuralgias of the sciatic nerve which have lasted for years and have resisted a great variety of medical treatment cannot be cured by electricity in a single month, but they may be started on the up grade of improvement and by the co-operation of the patient and sufficient persistence may be restored to satisfactory comfort, even if an absolute cure is not in every case obtained. Six months of skilled and faithful work on the worst of them will produce an enormous change for the better.

It should not be forgotten that diseases of the nervous system are often affected by the weather and atmospheric changes, that neuralgias in particular are sensitive to approaching storms, that relapses are the inherent tendency of this disease and that even the most complete cure of one attack does not—as does an attack of smallpox—guarantee the patient for life against another.

Neuralgias of any nerve of the body are curable by electrical methods if they are curable at all, no matter how out of the ordinary the cause may be. We recall the case of an estimable old lady who wanted to preserve at least the appearance of younger days. So she used a hair dye which unfortunately contained a mineral poison and set up a neuralgia of the facial nerves. She stopped the dye and nine treatments gave permanent relief.

Tic Douloureux is the type of difficult facial neuralgias. The intensity of the pain and its resistance to treatment make it the dread of physicians, even when they do not have it themselves. So far in our experience we have not met a case of failure to relieve by some electrical method. But that failure can occur and the utmost resources of medical science be defeated is shown in the following narrative:

A colleague in family practice had a young woman come to him with neuralgia over one eye. He faithfully exhausted, one after the other, the resources of drugs, local applications, and such resources of electricity as he knew how to use. With great sympathy for the sufferer and interest in the case he took her to a number of the best specialists in his acquaintance. She at length got into the surgeon's hands. The nerve was first stretched. Later a section of it was cut out. Finally the eye was removed. During five or six years she was mercilessly tortured by unresting agony and no satisfactory diagnosis of the cause of her pain was made by any surgeon or physician during her life. When she died in a Boston hospital she requested that an autopsy be performed and that her old friend and physician be notified of the result. The autopsy disclosed a small tumor in the cranium pressing upon the nerve. Electricity will not reach such a case.

Some authorities maintain that in most if not all cases of neuralgia we have to deal with an inflammation, either of the nerve structure or the tissues in close relation to it. But clinical experience with genuine cases of neuritis—inflammation of a nerve—demonstrates that functional neuralgia is as well defined as the neuralgic pains that accompany neuritis. And the latter condition has much more to its career than mere nerve pain. It can witness a course of chronic degeneration of the nerve, impaired motility of the muscles supplied, with atrophy of the affected parts, and organic changes greatly beyond the keenest functional sufferings of a pure neuralgia. But the agent of relief and cure is the same in both conditions. Electricity is the main remedy.

Inasmuch as almost any nerve in the body can be subject to pain there are many different neuralgias, identified by the situation affected. Intercostal, cervico-brachial, occipital, lumbar, phrenic, supra-orbital, are a few of the superficial type, and there are also deep visceral neuralgias affecting internal organs. But the technical name is of no moment to general readers. The important consideration is treatment and relief.

If the condition is pure nerve irritation the technic of electrical administration must be made to act in a sedative manner, soothing and healing as a lullaby to a sleeping infant. If pressure of exudation or blood stasis in the surrounding tissues causes the pain we must use a method which will force the absorption of the exudation, or "milk" the stagnant blood through the vascular supply and bring a new banquet of nutrition to the parts. If exudative fluid is locked up in the unyielding nerve sheath and the pain will not cease until it is driven on and out, the technique must make the muscle fibres perform this function by waves of peristaltic contractions which as effectually "milk" the sheath free of its exudates as the action of the muscles of the hand brings down the secretion of the udder. The principle is the same mechanically.

The dental nerves are particularly subject to pain. If this is neuralgia the remedy is electrical sedation. If it is the irritation of caries the dentist must fill the tooth, but regardless of this the pain can be removed and kept away for a long time even when the hole in the tooth remains unfilled. We have proved this in many cases. One of them, a young man with a foolish dread of having his tooth filled, had a cavity big enough to take in the end of a lead pencil, but after one treatment the pain did not return for three months.

After teeth are filled they sometimes remain sensitive to use, and hot or cold drinks may cause pain. Also, after teeth are either filled, or drawn the gums may be sore. All these conditions are quickly improved by sedative-curative restoration of the state of the tissues to normal by selected actions of electric currents. The relief afforded the patient is so comforting that every dentist might well have so neat an adjunct to his office—but none do.

And so, in closing this chapter, let it suffice to say that when any nerve-pain of any kind, anywhere in the body, distresses any one—man, woman, or child—and does not at once yield to simple measures or medicine the indication for electricity is self-evident.

# CHAPTER XIII.

## THE PECULIAR AFFECTION CALLED CHOREA, OR ST. VITUS'S DANCE.

Its Electrical History and the Celebrated Guy's Hospital Reports Concerning this Disease.

The children of nervous parents tend to nervousness. Chorea is a functional nervous disease, chiefly affecting children, characterized by irregular winking of the eyes, twitching of the face, spasmodic movements of the arm or hand, a variable amount of mental disturbance, some causal relation to rheumatism, and a remarkable liability to acute endocarditis (inflammation of the lining membrane of the heart). This is Osler's definition in plain language. If not cured it can extend to adult age and some cases are affected for life. Of drugs, Osler says: "The medical treatment of this disease is unsatisfactory; with the exception of arsenic, no remedy seems to have any influence in controlling the progress of the affection."

In a single family we have seen three of the children winking their eyes and screwing their faces; doing their best to hide the embarrassing but uncontrollable twitchings, shunning strangers, handicapped in school; and their parents calmly oblivious of the fact that the children had Chorea—a definite and curable disease. The parents regarded the contortions as a mere "habit" and paid no regard to them. But this is wrong. The mortification suffered by a sensitive choreic child can never be estimated by a phlegmatic adult.

Owing to the remarkable connection of this disease with the early history of electro-therapeutics, and its intrinsic importance among the functional neuroses which are curable with electricity, we give it a chapter by itself, feeling certain that no parent who may be interested in an anæmic and nervous child will fail to want all the information he can obtain about the prevention and permanent relief of so humiliating an affection. The grown person who is still afflicted will grasp at this chapter as the hungry babe grabs her dinner bottle.

It is an old disease. A standard English Encyclopedia published in London in 1790, contains the following remarks about the electrical treatment of chorea, commonly then and now called St. Vitus's dance:

> "The application of electricity has perfectly cured various cases of St. Vitus's dance, or of that disease which is continuously called so; for it is the opinion of some learned physicians that the real disease, which was formerly much more frequent than it is at present, is different from that which now goes under this name."

On October 28, 1778, Dr. Anthony Fothergill, Fellow of the Royal Society, Northampton, England, wrote a full account of a cure of St. Vitus's dance by electricity, and early medical literature contains a number of similar reports.

At a later date chorea was destined to be one of the test diseases selected to demonstrate and confirm to the medical world the value of Static electricity. It therefore possesses a peculiar interest which justifies the space we here accord to it, for although it does not endanger life, and physicians who have none of it themselves do not regard it seriously, yet it can ruin a boy's career in business and make a girl miserable in society.

In 1837 an eminent physician upon the staff of one of the most celebrated hospitals in London—the author visited the very room where these researches were carried on—began the remarkable investigations into the merits of Static electricity which have ever since constituted the most famous landmark in the clinical history of this form of current. The results of these clinical tests were published in the official volumes of the hospital reports and can be seen in medical libraries such as that in the Academy of Medicine, New York City. The detailed hospital record of each patient is given by Dr. Addison, whose report is entitled, "The Influence of Electricity as a Remedy in Certain Convulsive and Spasmodic Diseases." His opening remarks are worthy of our attention seventy years later:

> "It must have occurred to every one engaged in extensive practice to meet with cases of convulsive and spasmodic disorders affecting females, and with cases of chorea in both sexes, which, while they occasion extreme distress to the patient and to the patient's friends, have baffled every attempt to afford permanent, and, in some instances, even temporary relief.

"It was while brooding over the humiliating failure of a host of remedies employed in one of such cases, and which will be described in the sequel, that as a last resource, I determined upon giving electricity a fair trial. I was, perhaps, in some measure induced to do so in consequence of having the opportunity of securing the assistance of Dr. Golding Bird in its application. The effect produced by it at once gratified and surprised me, and led to further trial, the results and particulars of which will not, I trust, be deemed altogether unworthy of the profession.

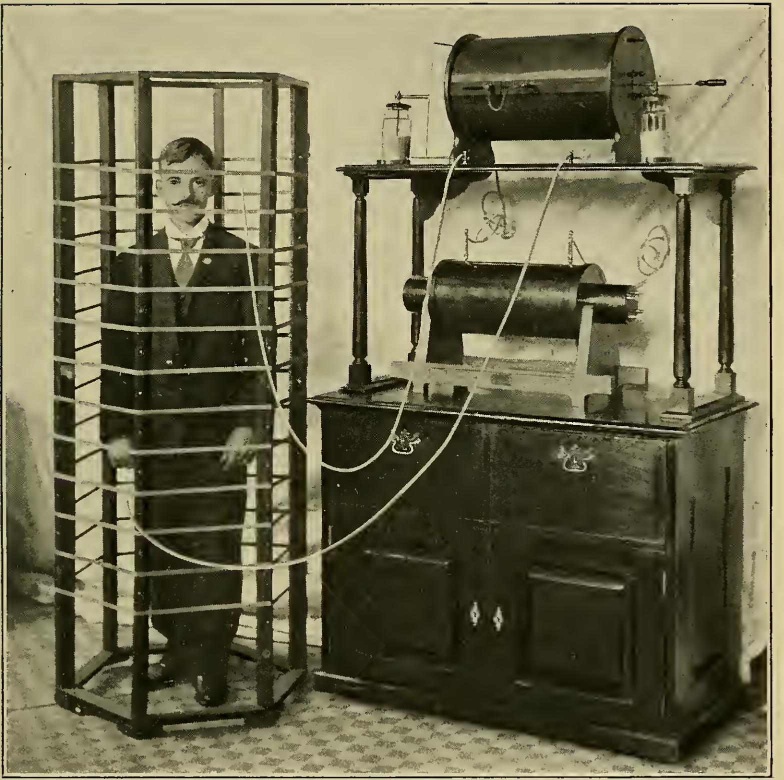
It is unnecessary to insert here the detailed clinical cases with which the visiting physician of Guy's hospital supported his belief in the value of static electricity. The subject awakened imperishable interest and the investigations were continued. The second report was made in 1841 by Dr. Golding Bird, A.M., M.D., F.R.S., etc. Dr. Bird reported the results and details of treatment in thirty-six cases of *chorea*, among the causes of which were cited the following: Fright, sudden arrest of menses, epilepsy, excessive loss of blood in a previous illness, rheumatism, exposure to cold, irritation of worms, terror, intestinal irritation, amenorrhœa, injury, grief, etc. Among his preliminary remarks were the following statements:

"Of course, all claim to originality or even novelty is out of the question, electricity having long been enumerated among the ordinary remedies applicable to convulsive disorders generally. It is nevertheless much to be feared that many persons like myself have been led greatly to *underrate its efficacy*, either in consequence of its vague and indiscriminate recommendation, or from the inefficient and careless manner in which it has been applied.

"*Certain it is that although I have often ordered it myself, and have more frequently witnessed its employment by others, I had never for a moment entertained the belief that it possessed the power over the disorders alluded to which I am now inclined to concede to it.*

"It is almost superfluous to observe that the convulsive and spasmodic disorders of females alluded to are such as, in a large majority of cases, are connected with some irregularity of menstruation; neither is it necessary to dwell upon the difficulty of distinguishing merely functional from organic diseases of the nervous centres; these being matters with which the profession at large is perfectly familiar.

"It is but right to state that the following cases have not been selected because the treatment proved more or less successful, to



A HIGH-FREQUENCY "AUTO-CONDUCTION" APPARATUS

In the field occupied by the patient an electric incandescent lamp will glow without wire connection. The action within the body is an alterative-nutritional impression on the nervous and circulatory systems. The patient may sit on a stool, or stand. The bands of copper ribbon surrounding the patient are connected by two conducting cords to the resonator.

the exclusion of others in which it fails. On the contrary, they comprise the whole of the cases hitherto subjected to the electrical process and hence afford, as far as they go, a fair promise of at least occasional benefit from the application of this powerful agent in the treatment of the diseases specified. However undesirable it may be to encumber our reports with a detailed history of cases, such a method of procedure becomes almost indispensable in the present instance and I shall without further comment proceed to lay before the profession a brief description of the mode in which electricity was applied.

"In October, 1836, the treasurer, Mr. Harrison, set apart a room in the hospital for the exclusive use of electricity, all apparatus in which is kept in thorough working order. The out-patients and those in wards attend this room daily at three o'clock. Notes of their cases are taken by one of the students who acts as clinical clerk. A competent female attendant applies the electricity to female patients. In this manner every case is registered, its progress watched by the pupils, and any change in the treatment is directed by myself, for which purpose it is my duty to attend two days during each week.

"Having from the time this plan was commenced, five years ago, had a large number of cases treated in the electrical room, I consider that the report of the results of their treatment would neither be useless nor unacceptable to the profession, especially as there does not exist, so far as I am aware, any account of modern date of the results of electricity in this country on anything like an extended scale, save some that partake too much of empiricism to be worthy of confidence.

"It may now be asked in what light is static electricity to be regarded in the treatment of chorea and certain involuntary motions of the muscles analogous to those occurring in this disease? From the results of the cases treated at Guy's hospital no doubt can remain in the mind of any one that electricity exerts a decided, not to say specific, influence on these affections, and although on its first application the symptoms may sometimes become increased, yet where it has been persevered in, as in thirty-five of the thirty-six reported cases, it has either completely cured (thirty-one were cured) or greatly relieved the patient. The only case in which it failed (the twenty-ninth of the table) could scarcely be regarded as a fair one, as there was but little doubt that organic disease of the spinal cord existed.

"It may be next inquired, in view of the remarkable influence exerted by electricity in the treatment of chorea, whether we ought to trust to electricity alone. In answer to this it may be stated that I have repeatedly treated severe cases of this disease successfully with this agent, without the aid of any medicine at all; and in the majority of the thirty-six cases in the table no internal medicine except an occasional purgative was administered during the electrical treatment.

"Still it is obvious that in many cases the disease is kept up and excited by the irritation produced by some deranged function, and this of course it will be the duty of the physician to set right before or during the application of the electricity. The case of Eliza Raven affords an interesting illustration of this. Here the chorea either depended upon the non-performance of the uterine function or was kept up by it, and accordingly a few electric sparks through the pelvis at once cured the patient by restoring the deficient menstrual discharge."

Passing now from the remainder of Dr. Bird's report, which dealt with rheumatism, paralysis, hysteria, and menstrual derangements, we find *chorea* discussed again in 1846 by another physician on the staff of Guy's hospital who made an official report upon one hundred cases. From the report of Dr. H. M. Hughes we next cite briefly:

"The effects of electricity in chorea are sometimes very remarkable. On some occasions I have known it to effect a cure after a great variety of other remedies had for weeks and months been tried in vain.

"When the body has been wasting, the mind apparently giving way, and the disease proceeding unchecked if not increasing, notwithstanding a variety of remedies employed assiduously and for a long time, electricity has under my own observation and direction effected a really remarkable change. This change has not been more beneficial than it has been rapid. In the course of a week or ten days' daily treatment the entire aspect of the patient has been changed. The motions of the extremities have been reduced to the control of the will; the body has become comparatively robust, and the face plump; the countenance has lost its vacant expression; the disease has in fact been cured, and the effects of the disease upon the health and appearance have ceased.

"When electricity acts beneficially in chorea it produces its effects more rapidly than any other remedy with which I am acquainted, but it is a remedy which is not of universal application in chorea. The cases in which it appears to be more especially applicable are those occurring in young women, in whom the disease assumes somewhat of an hysterical character, and those protracted cases in boys in whom other remedies have been tried ineffectually and in whom the disease is dependent upon no obvious source of irritation and has an injurious effect upon the general health instead of being affected by it."

In 1853 these celebrated reports were concluded by one of the foremost physicians then living—Sir William Gull, M.D., D.C.L., F.R.S., etc.—who presented twenty-five cases of chorea among a large number of cases of other diseases treated by static electricity under his supervision. We shall here refer only to Gull's conclusions about chorea:

"The remarkable and in some instances astonishing results obtained by electricity in chorea would seem to warrant the assumption of some direct controlling power in the electrical force over the nerve centres, but these are probably in part due to the known action of this stimulus upon the tissues. Dr. Bird in his report upon the subject refers them to the counter-irritation produced upon the skin, but I am rather disposed to believe that the good effects are the results of a direct stimulus to the blood-vessels of the nerve centres, producing a more tonic and vigorous circulation in them.

"In the fifth number of these reports Dr. Addison contributed a valuable paper 'On the Influence of Electricity in Certain Convulsive and Spasmodic Diseases' and there recorded several cases of chorea successfully treated by electricity. The illustrations were not numerous, but they were unequivocal, and sufficient to render it highly probable that electricity was in fact a remedial agent in this disease. Further evidence tending to confirm the results already obtained was given by Dr. Bird in his report in the twelfth number. Here we have therefore great confirmatory evidence of the results offered by Dr. Addison. In the eighth number of the second series of these reports Dr. Hughes in his 'Digest of a Hundred Cases of Chorea' speaks especially of the value of electricity. The cases included in the present report (twenty-five) are confirmatory of the opinions formed by these excellent observers.

"I have many times witnessed the most decided good effects of electricity in chorea. It has appeared to me to effect most good when the whole spinal system has been implicated, where the movements have been both universal and severe, provided there has been no complication. I have seen children so severely affected that it was with difficulty they could he beld on the insulating platform or retained on the knee of the nurse, while the sparks were being drawn from the spine, and yet after two or three applications they have become so much better that they have sat up by themselves, and after a few treatments walked into the room without support.

"We must be especially cautious not to be misled by cases occurring at or after the middle period of life; for although true chorea may occur at any age it will be admitted that in advanced life the cases of involuntary action of muscles are more commonly allied to *paralysis agitans*, and are often the precursors of a more general affection, as I shall attempt to show further on.

"All proper exceptions being removed, the fact stands well established that electricity is at present to be ranked among the means at our disposal for the cure of chorea, and that in severe cases its effects are often truly surprising.

"*When other means cannot be employed when the patient is scarcely able to swallow; when the skin is abraded from the prominent bones of the emaciated frame; when the powers of life seem nearly exhausted, sparks of static electricity applied to the whole length of the spine will often, after a few repetitions effect a favorable change and enable us to administer other means of cure.*

"Not only in these extreme cases does this agent greatly help us, but in minor ones its effects are proportionate. Since, however, chorea, like names applied to other diseases, does not express a constant and invariable condition, the means of cure must be varied, and of course electricity not being applicable to all cases must fail in some."

*The exact and methodical care* with which the investigations in the action of static electricity were conducted in Guy's hospital for seventeen years or more, give to these reports a conclusive value, which is not impaired by the fact that numbers of physicians to-day who have no electrical apparatus and have never studied the subject "do not believe in electricity."

With our more modern and efficient machines and improved technical methods electricity is a more important remedy than it was a generation ago. The mild tonic action of general electrification is particularly suited to chorea affecting weak, nervous, and timid children. Even if we grant that a great many cases recover with the help of a little medicine, yet many do not, and the average results of medical treatment will be made more certain, more quickly attained, and with an early and immense relief to the patient's nervous tension and decided improvement in general health, when electricity is employed in conjunction with indicated remedies. It is efficient in some cases alone, and when rheumatism and general debility complicate the chorea it is more than ever needed and should be employed in every case with an intelligent adaptation of the method to the state of the patient.

In the very small proportion of cases in which it fails to make a decided impression on the spasmodic symptom, its influence for good upon the nutritive processes, pelvic functions and upon the cerebro-spinal nervous system in general, indicates its aid as one of the best and most grateful helps the patient can receive.

That there are some causes at work in the production of exceptional cases of chorea which render them practically incurable is self-evident, and it is not necessary to explain that electricity will not cure every one. In these incurable cases, however, the nervous state is usually so much below par that static electricity may well be employed for other purposes than to stop the spasm.

It will improve the strength, composure, confidence and spirits of the child or grown person, and in this way, if in no other, will be beneficial to the extent of perhaps one-half the value of a radical cure.

In partial choreic affections from chronic spinal disease the muscular movements cannot be made normal, but the patient can nevertheless be given so much comfort and relief from various symptoms (pain, irritability, morbid mental state, etc.), together with added strength to the arm or part affected, that he will express decided satisfaction even when the physician will note that the so-called *chorea* is nearly as bad as ever. It may be, but the *patient* is better, and is often inexpressibly grateful to electricity for the measure of relief afforded by it.

At the present date Static electricity is serving many physicians in the treatment of chorea, both in large cities and in our smaller towns, so that the evidence of its merits has accumulated greatly. A few years ago, the Professor of Nervous Diseases in the leading medical college of Chicago reported his results in eighty-eight cases, of which only five were in the recent stage which is most favorable for treatment. This report has been published in the official Transactions of the American Therapeutic Association and can be referred to by any physician who desires. He says in part:

"The immediate effect of the treatment on these patients was often magical. Just as soon at they became completely charged on the platform the violent contortions would stop and the patients remain quiet as long as the treatment was continued. The more chronic the case the longer the treatment was necessary. Eighty-three of the cases had resisted the treatment of the family physician, and were subjected to static electricity because the physician or parents, or both, were discouraged with the effects of other remedies. I have just completed the successful treatment of a case in which the disease had continued uninfluenced by all other treatment for two years."

The treatment of chorea in adults generally requires much more persistence than in children, as it is often more chronic and the physician must select his cases properly, for electricity will only improve those cases which fall within the range of its physiological actions.

If the patient is muscular, strong, well nourished, with good appetite and digestion, and practically without symptomatic disturbances except the spasmodic movements, it may be very difficult to do such a patient great good in a short time. If the patient is at the antipodes of the *electro-positive* state of general health—is *negative*, anæmic, neurasthenic, the whole muscular and nervous system debilitated, with broken sleep, headaches, spinal and muscular pains, and other symptoms which are much more frequently met in these cases than otherwise, electricity will do good in direct proportion to the degree of the negative state. It is now the chief remedy in the treatment of the majority of cases of chorea.

# CHAPTER XIV.

## THE TRUE RELATION OF ELECTRICITY TO PARALYSIS.

A Presentation of the Facts in a Conservative and Moderate Manner for the Instruction of the General Reader and Family Practitioners of Medicine.

In a systematic treatise upon medicine the symptom *paralysis* is discussed under fifty-two different heads. This shows how much more variety there is to this subject than the average reader supposes. But it is a curious comment upon medical-college teachings that while we find many other conditions in which the results of electrical treatment are more rapid and brilliant than they are in the graver forms of paralysis, yet almost every practitioner will tell the paralytic to "try electricity," and in better cases he will pass it by.

He is right in recommending the great resources of modern electrically operated apparatus (not the old-time tawdry faradic box), for he has no medical remedy for paralysis and he knows it, but two-thirds of the profession are late in learning the immense value and indispensable benefits of electricity in many common diseases besides paralysis.

In general functional nervous diseases, chorea, hysteria, nervous debility, cerebral and spinal congestions, neuralgias, muscular rheumatism, chronic articular rheumatism and gout, states of pain, certain diseases of the skin, many of the pelvic diseases of women, in functional heart diseases, and in a wide range of troublesome symptomatic disturbances, electricity, rightly used, is more gratifying in its results than the skill of man can possibly be in the paralyses of central lesions and degenerative processes—and all the world ought to know it.

Nevertheless, electricity is the most important remedy that physicians know for the treatment of paralysis, whether it is a curable or incurable form. For even in the latter we have the patient to deal with and his condition must be maintained in the best state possible. In the degenerative central lesions it means a great deal to the patient to be kept free from extremes of suffering and on a slow downgrade instead of a rapid one. And electricity can do this.

We shall now explain the various paralytic symptoms of different diseases and state the true relation of treatment to them.

Paralysis is not a disease, but merely a *symptom* of certain forms of injury or disease which cause the partial or complete loss of motor function of the muscle fibres. The impairment or loss of function may be caused by various constitutional diseases or injuries which affect the motor nerves at the periphery; or the cause may be reflex irritation from a remote part; or degeneration and destruction of the central nerve cells may abolish the power of contraction—not in the muscle fibres but at headquarters where no remedy will wholly restore it or renew living tissues out of the ashes of decay.

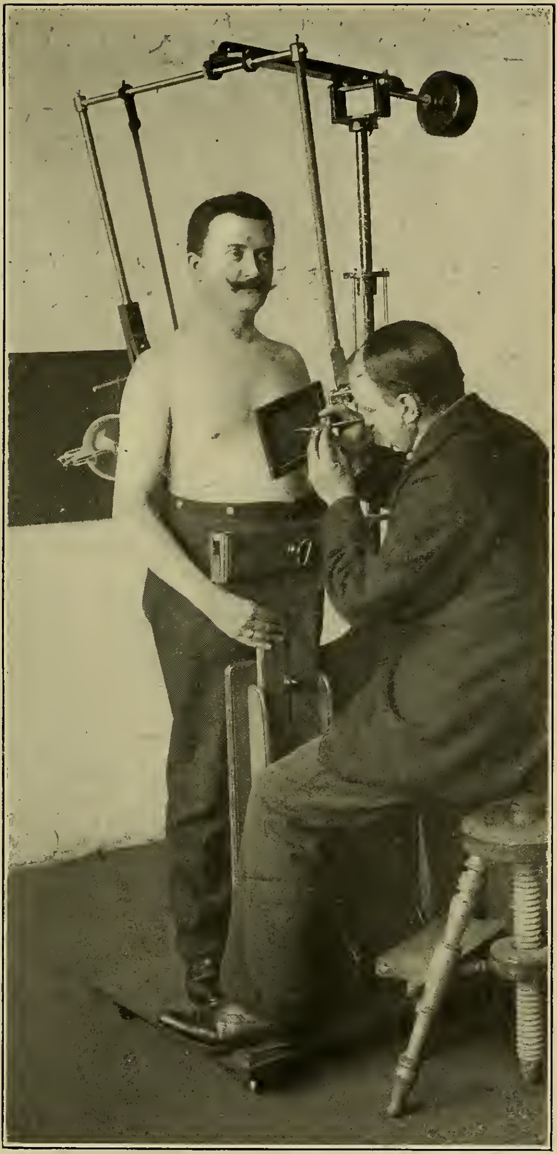
In estimating the probable value of electricity in any case of paralysis—and it is the only means we have of producing energizing contractions of muscle fibres independent of volition—the cause and condition behind the loss of function must be considered. The paralyses which result from diphtheria, smallpox, typhoid fever, syphilis, rheumatism, gout, hysteria, lead poison, and absorption of other minerals, are generally curable; and if not every case is brilliantly cured, it at least may be greatly improved.

Some of the results in rheumatic and hysterical paralysis are produced by a very few treatments, while more obstinate cases may require several months of work before the limit of improvement is reached.

Electricity is especially important in post-diphtheritic paralysis—when this is a pronounced sequel of the disease. No child should be left to tread the slow steps of time toward recovery when muscular strength and health can be so readily and promptly restored by the aid of electricity.

Paralysis caused by exposure to a draught of cold air, or exposure to cold and wet, is expected to yield to electrical stimulation with a fair degree of promptness, but if long neglect has developed atrophy of the tissues it will take them longer to recover. Facial paralysis of this kind is a common occurrence. Ten minutes of skilfully applied electricity three times a week is worth ten gallons of liniment. Relief from the stiffness and discomfort begins at once and normal function returns in a short time.

When paralysis is due to a mechanical injury of the muscle or



A SCIENTIFIC X-RAY INSTRUMENT OF PRECISION

This device for "correct writing" is called the "Orthodiagraph," and is one of the two essential instruments for accurate X-Ray examinations. The operator is seen tracing the outline of the heart. The pencil point and focus of tube move in unison. All distortion and magnification are eliminated, each mark being the record of the central axis of radiation at right angles to the plane of examination.

nerve it will be curable if the path of conduction from the nerve centres to the muscle is unbroken or capable of being repaired. The lessened motility of muscles after fractures, dislocations, and wounds which have required splints for their healing are familiar examples, and the tonic contractions which can be set up by selected electrical technics would surprise those who have trusted to massage and time for recovery.

Paralysis sometimes results from *pressure* upon the nerve trunk, and may remain as a symptom after the pressure is removed. Persons who have used a crutch improperly, who have slept with their arm under their head, or who have sat long on a sharp edge, have sometimes found a limb paralyzed afterward. Medical history contains singular examples of severe and long-lasting paralyses from these ordinarily innocent causes and electricity is the remedy for all of them.

When paralysis, and atrophy of muscle-masses, result from an inflammation of a nerve (neuritis) recovery is often a slow process. There is practically no remedy but electricity and few cases get well—even after the lapse of twenty years—unless they are treated with this agent; and not only treated but with skill and efficient current action. Sometimes it takes a year of the best treatment to finish a case. A great deal depends upon the stage of the disease. If it is treated from the onset it will be tedious enough. If it has been neglected for three, five, or ten years, and if the atrophy of multiple neuritis has wasted the muscle fibres down to the bone, it will be hard to repair the disastrous ravages of time. All these conditions should seek treatment at the earliest possible moment and keep it up until the physician has done his utmost.

The obstetrical paralysis of infants, resulting from pressure or accident during delivery, is nearly always curable by a little persistence and knack in the uses of electricity. The youngest and tenderest infant can be treated by a competent physician who possesses efficient apparatus and who knows how to manage both it and the baby. No pain or disturbance will be caused by the current and the child will usually not object. But in some cases in our experience it was necessary to persist in treatment for a long time. This is, however, a welcome alternative to allowing the child to grow up with a crippled arm or leg.

Reflex paralyses are generally curable by proper treatment. Few of the laity are aware of the important influence of "reflexes" in the human body, but perhaps some idea of their importance may be conveyed by the statement that the entire therapy of modern scientific hydriatics is based upon reflex action. By the stimulation of certain areas of nerve supply in relation to inner organs the organs themselves can be made to respond almost as to direct treatment. For example, stimulation of the cardiac reflex will cause the dilated heart to contract. Reflex irritations from certain lesions of the rectum cause very disturbing symptoms elsewhere.

The paralysis of young children—anterior poliomyelitis—which results from an acute inflammation of the spinal cord, must look to electricity for its only hope of improvement. But inasmuch as many of these cases have been sadly injured by neglect of early treatment, or by improper braces, etc., they will tax the patience and resources of both parents and physician. Still, the result of depriving the limb of treatment is so costly to the grown-up man or woman that any work upon the child, no matter how tedious it may be, is a duty which the parent cannot shirk.

If the muscles will respond to an induction-coil current it demonstrates that the fibres have sufficient vitality to make a more rapid improvement; but if the limb is cold and wasted and will not contract to the stimulus of even an interrupted galvanic current of ordinary dosage the child will gain very slowly. In some of these cases treatment must be kept up about twice a week for half the year with intervals of one or two months at a time, and must be thus persisted in for several years before the utmost gain will be accomplished. But faithfulness in this matter means the difference between seeing the child hobbling along with a crutch or heavy brace and a youth of skating, dancing, and participation in all the sports of girl and boy playmates. It is worth trying for.

Painters and others who suffer from lead poisoning and who have "wrist drop"—the peculiar form of paralysis which affects the hand and wrist—may be improved greatly by judicious electrical treatment. Painter's colic, and, in fact, all the evil consequences of mineral absorption, require the eliminative action of suitable electrical technics, followed by the tonic and restorative actions of other indicated methods. The sovereign curative influence—and we have had under treatment at a single time six cases of lead poisoning—is to be found among the efficient resources of modern electro-therapy.

Rheumatic paralysis is one of the commonest forms of impaired motor function—seldom extending to a true paralysis—but which illustrates some of the most brilliant actions of electricity. They are our most frequent cases and when the crippling disability is muscular rheumatism—when the patient could not step up a stair with the lame leg foremost—we have over and over again restored the muscle function in five minutes so that the patient could step up and down from the Static platform without help and walk about the room with comfort, energy and quickness. This immediate benefit becomes more and more lasting after each treatment, and in from six to a dozen applications these cases are usually cured. When the rheumatic paralysis is of a different nature and the joints are diseased recovery is less rapid and may not be so complete, but electricity is the most efficient treatment.

There are two forms of paralysis described in medical text-books as *hemiplegia* and *paraplegia.* In some few cases these depend upon the direct influence of cold, or arise from atony or hysteria, and here electricity is of the greatest service—both adequate and indispensable to a cure; but the terms hemiplegia and paraplegia are most often associated in the medical mind with what the general reader calls *apoplexy*, or "stroke of paralysis."

When the patient survives and enters upon a long, slow period of partial improvement *time* has been the chief reliance of both patient and physician, and as the result we find these cases of paralysis most frequently reaching a state of advanced atrophy and discouragingly hopeless conditions before they are advised to seek the aid of electricity. They leave to the last what should always be the first resort.

When time—time passed without electrical treatment—has far advanced the tissue changes of extreme muscular atrophy and destruction of the nerve centres, a restoration of the destroyed nerves —a cure—is out of the question and a very marked improvement is difficult. The average physician, he of the common faradic battery, treats these patients a few weeks or months and tells the patient that "electricity will do him no good"; or the patient who sees no benefit gets tired and quits. Others with more efficient apparatus and skill treat these cases with more persistence and with better results. In our own experience with many of these sympathy-appealing subjects we have seen some cases show more improvement the second year than they did the first, although treatment was interrupted for long periods at a time.

If the patient comes to the office from confinement in the house, with a nervous system shattered from suffering or anxiety, with muscles wasted by lack of exercise, and the whole body debilitated, the immediate effects of general tonic electrical energies and localized applications to the spine and muscular surface, will relieve pains, promote sleep, give passive exercise to the paralytic muscles, renew vigor and tonicity, and in two weeks will produce an apparently remarkable change for the better. But this improvement must not create a false encouragement. So far the patient has been benefited simply by lifting his general system up to the level of the actual disease, and treatment has only removed the symptomatic suffering and the debilities of previous house-confinement; the treatment of the actual paralysis is just begun.

After this time the prospects of improvement in a case of hemiplegia of undetermined severity depend on three things:

1. If the central lesion is a small hemorrhage which will reabsorb, or any injury which time will make better, the patient will gradually improve in proportion as the condition in the brain improves. But, if left to time alone, the paralysis will linger long after the effusion absorbs, while the results of adequate electrical treatment are very satisfactory.

2. If the central lesion or injury is of a character which retrogrades, the road before the patient is all down hill and treatment can produce only a temporary benefit, or assist the patient to be made more comfortable while he lives.

3. If the injury within the head or spine has reached a maximum of damage and remains in a chronic quiescent state the patient will, if left to time alone, witness a very gradual improvement. Late treatment will make his muscles useful in proportion to the existing state of the central cells and fibres, but if proper electrical treatment is begun before the state of muscular atrophy ensues far better results can be obtained in less time.

It is well known that a first "stroke of apoplexy" may be very mild and the patient recover from it quickly, to be followed in the course of time by a second attack of greater severity and from which the patient does not so well recover—the nutrition of the vascular walls undergoing a gradual degeneration.

So long as any inflammatory process remains in the acute stage no *stimulating* electrical application should be made, but sedative, nutritional administrations are a different matter and should begin as soon as the patient can make office calls for treatment. Galvanic and faradic currents (of stimulation) were limited to their uses to contracting the muscles after time had been given for absorption of the clot. Used early and directly through the brain they were rightly regarded as injurious. But about the year 1860 or 1861 an eminent French physician, one of the Nestors of scientific electro-therapeutics to whom all the world of medicine is indebted, asked the following question in his manual on the subject: "Will the action of electric currents upon nutrition, or their immediate chemical effects, permit us some day to attack the central lesion and to favor the absorption of clots and the restoration of softened nerve substance?"

Ten years later Dr. Arthuis replied: "Static electricity has settled this question. It is above all things a regulator of the functions and a dispenser of equilibrium. It regulates the circulation (sanguinary as well as nervous), and it thus aids in the absorption of clots and the nutritive improvement of the vascular walls within the brain. Also, not only have we never had any accident in commencing treatment immediately after the hemorrhage, but recovery is more certain, and especially much more rapid, than when the patient has waited many months."

The old idea that electricity must always be a "last resort" sort of treatment, only to be "tried" after the failure of all else, and as a desperate measure something like the administration of "extreme unction" to a dying man, has become as obsolete as the primitive apparatus on which it was based. Modern construction of scientific instruments places the resources of electric currents among the first remedies to consider in more than half the ailments that afflict mankind.

And in the treatment of paralysis we have also another side of the subject to consider, to wit, the relief of the pain and stiffness of muscles which often cause the patient as much actual discomfort as the crippling of strength. Quickly to abate the pain or soreness, coldness, and stiffness, which are most often present, there is nothing equal to a warming, sedative, nutritional and tonic, electric current, whether the face, arm, back, or lower extremity is affected. The selected current poured steadily in the tissues is wonderfully efficacious. And these *nutritional* currents, skilfully applied, decisively warm and relax and energize the cold, stiff, and aching muscle fibres of the part. They feed them with tonic rest. They surpass all local applications of drug prescribing as sunlight surpasses the glimmer of a star.

And in addition to the motor palsies there are analogous impairments of *sensation.* With stimulating resources of electricity we can rouse up the numb and often tingling sensory nerves and awaken them to normal action—in most cases. If the lesion is central, especially if a degeneration of spinal nerve roots, the gain will depend on the possibility of arresting the process and holding it in check. In many cases of *paræsthesia*—as these sensory paralyses are called—cases even which have resisted medical prescribing for a long time, we can do something definite with electrical energies and either restore the use of the affected parts or give the patient sufficient benefit to reward him. In all superficial cases the removal of the numbness takes only a few treatments.

There is very much more to the subject of paralysis than this, but in the brief limits of this small book only a fractional part of electro-therapy can be dealt with. Suffice it to say that in any condition of paralysis of either motion or sensation, whether partial or complete, the patient should consult the most approved methods of employing the best resources of medical electricity. And technique and current are both important; for unskilful treatment, and the selection of an improper current and dosage by an untrained adviser, have caused many a degenerated muscle to become totally paralyzed when proper treatment would have restored strength. The worst cases demand patience, and medicine contains no alternative.

# CHAPTER XV.

## GOUT AND ITS NUTRITIONAL TREATMENT.

The Historical Malady of Malnutrition and Its Dependence for Relief upon the Physical Agencies.

THE subject of gout is one of great interest to the person who has it. Its treatment has long been studied by physicians. But what is this celebrated malady?

"It is a *nutritional* disorder, one factor of which is an excessive formation of uric acid, characterized clinically by attacks of acute arthritis, by the gradual deposition of urate of soda in and about the joints, and by the occurrence of irregular constitutional symptoms. The precise nature of the fault in metabolism (the ultimate changes of tissue nutrition) is not known, but there is probably a defective oxidation of the foodstuffs, combined with imperfect elimination of the waste products of the body. The gouty diathesis is expressed in a neurosis of the nerve centres, and a peculiar incapacity for normal elaboration of food, whereby uric acid is at times formed in excess, or is not properly transformed into more soluble and less noxious products."

Now, these definitions of Cullen, Duckworth and Osler could not be better expressed to present a call for the eliminative, alterative, nutritional, tonic, pain-relieving resources at our command in modern electrically operated appliances. The reader who will turn to previous chapters setting forth the physiological actions of different electrical energies, especially of light rays, radiant-heat and high-potential currents, cannot fail to recognize the remarkable fitness of these remedies to the treatment of gouty conditions of the body. Far back in the earliest records of frictional sparks we find mention of their application to this disease, and in Hall's encyclopedia, 1790, the following item was contributed by a scientific authority of high repute at that date:

"The gout, extraordinary as it may appear, has certainly been relieved by means of electricity in various instances. The pain has been generally mitigated and sometimes the disease has been so well removed as not to return for some time."

The modern treatment of gout is written up at some length in medical journals and text-books, and great ingenuity is shown in suggesting methods of relief. In addition to drinking large quantities of water, the regulation of diet, and routine medical remedies, the treatment of gouty patients is generally supplemented by baths, exercise, massage, stimulating ointments and lotions locally—but very little has been said about the one remedy which contains and surpasses them all.

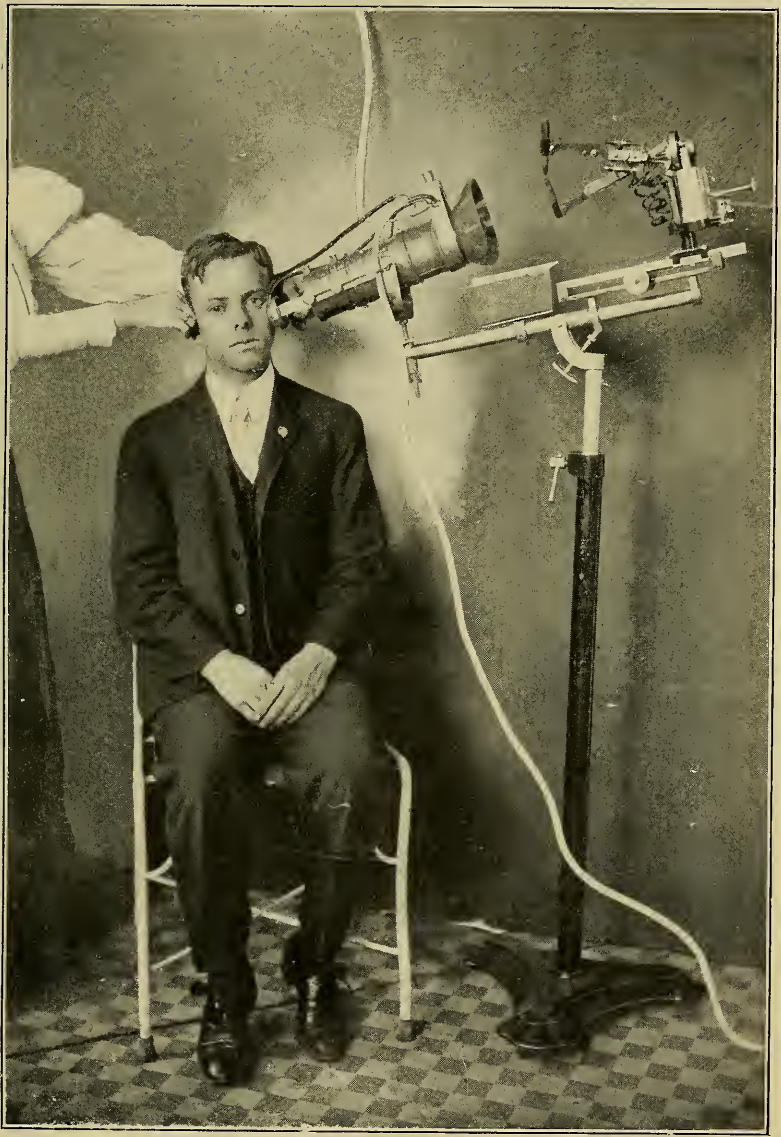
When the patient is confined to bed with an acute inflammation the customary routine will usually be employed, but in all other stages of the lithæmic diathesis the superiority of electrical technics is beyond compare. If baths are required for the elimination of products of waste we show in a previous chapter that the electric-light bath is more eliminative than any other. If "active exercise" will benefit a gouty patient the energizing contractions of electricity will both prepare him to take it with endurance and enjoyment or take it for him while he is sitting still. If he becomes fatigued from an excess of exercise or work while convalescing, electricity will banish the ill-effects.

If "passive exercise" in the form of massage is recommended there is no masseur endowed by training or by capabilities of technique with the ability to produce the deeper acting, more quickly administered, and infinitely superior massage of the static spark. If joints can be benefited by ointments we have simpler methods that are neither greasy nor odorous, and covering all the effects from soothing a painful and tender state to stimulation, counter-irritation, and strong contractions of muscles and ligaments.

In the *Medical Record* of December 11, 1897, we find a physician of thirty-two years' experience, and who *has the gout himself*, thus stating his knowledge of what electricity regularly does in competent hands:

"From careful observation and experience the author asserts that gout and kindred diseases can always be checked, relapses prevented, and in many cases cured, by the judicious application of electricity, particularly of the static current."

In the practical experience of the present writer the combined



AN ARC LIGHT WITH NEW FORM OF COMPRESSION CYLINDER

This device is so mounted that it can be applied to the treatment of a patient either sitting or reclining. The arc is left exposed for illustration. It is a beautiful apparatus.

resources of selected light rays, high-frequency and high-potential currents, and the Nauheim bath enable us to secure *the utmost possible benefits* for the gouty patient. For these remedial resources represent the most active elimination of effete material and the most energetic reinforcement of nutrition.

And the importance of this subject is not by any means limited to the popular impression of gout as the infirmity of the rich, for it has little real connection with what is called "high living." Gouty symptoms and goutiness in lesser degree develop among the poor and can be as painful in semi-starvation as in the midst of plenty. But in this country some "rheumatic and gouty" pains and swellings have other causes behind them than a disturbance of metabolism and it is fortunate that in all these states electricity is still the efficient and paramount remedy. The discriminations in diagnosis which perplex and may baffle the prescriber of drugs do not alter the basic fact that the patient requires the physiological regulation of his nutritional functions—and the means of doing it are stated above.

For its value as corroborative evidence we shall now submit other testimony than our own concerning the benefits of electricity in all the disturbances of the *lithæmic* state known as gout. The narrative which follows was written by a prominent practitioner, an ex-president of the American Electro-Therapeutic Association, and able to speak from the personal experience of a victim of the gout, inherited through three generations. The author knew him well and can easily demonstrate the accuracy of his assertions regarding the results of electricity.

"I inherited gout from my grandmother; have had attacks for twenty years; these have become more serious and frequent. I had all the usual symptoms—excruciating pains—with all the sufferings described in the text-books—often could not move at all, or, if a little better, hobbled in agonies on crutches.

"Some attacks were aggravated by colic during which kind friends suspected appendicitis. Medicines which allayed the pains sometimes, failed at others, as did also different remedies. The climax came in September, 1892, when acute articular rheumatism complicated the case so that even turning in bed was impossible, so excruciating and constant was the pain.

"The case was then treated by a physician of the highest standing and reputation, a professor in the largest medical college of New York, a man of ample means, a gentleman in every sense of the word, whose attention—a work of love—could not be exceeded by any one and whose kindness will never be forgotten. But medicine, pushed for many weeks, gave no relief or benefit. The prognosis was bad. The patient could not take more medicine and grew very weak, in which state he was seen by several members of this Association, who never expected to see him alive again—in fact, he was once declared dead.

"Finally, improvement followed but I remained in a low state, crippled, and tied to crutches most of the time.

"In the beginning of 1893 friends recommended static electricity and the first applications were made three times a week. In due time I could walk well without any support and without pain. In the spring I met in a car my former medical attendant who was surprised to see me looking so well and would not believe that electricity, without any medicine, had made the improvement. Since then the electrical applications have been resumed whenever required.

"Sometimes, on purpose to test the effect, treatment was delayed until a new attack was so far advanced that the great toe was swollen and so painful that I could not walk and was obliged to use a crutch to get down-stairs to my office where the static application was made. The first treatment ameliorated the bad symptoms, the second made the state comfortable, and the third—all in the same day—aborted the attack. No special diet was enforced during the electrical treatment. Occasionally alkalies were taken which never benefited and sometimes even increased the uric acid and general irritability.

"By means of this current I have been kept so well as to enjoy life without any serious sickness for five years. The hereditary gout is not eradicated, but all acute attacks have been warded off by the timely use of electricity."

While few Americans may consider that they have gout, yet what we say here applies to all the conditions for which Lithia and other alkaline waters are sold. Any degree of interference with metabolism calls for nutritional improvement and the resources of electricity. Since the introduction of radiant heat and light radiations we are able to accomplish beneficial results more quickly and thoroughly than when static currents alone were used. Nothing in the electrical portion of treatment interferes with other measures of diet, medicine, and personal management, which a given case may have found to agree with him. But electrical actions aid all other measures most decisively.

It is unfortunate that a medical knowledge of physiology is required to enable the reader to grasp the function of *exercise* in regulating the circulation, promoting the normal state of the different organs and aiding thereby to help eliminate effete materials from the body. And when joints are painful we cannot take sufficient voluntary exercise. Now apply the beautiful, tonic, muscle-invigorating and deep-acting contractions that we can set up by certain interrupted currents of electricity—notably, without the removal of a single garment, by the powerful mechanical stimulus of thick static sparks. Then consider the immensely valuable assistance that this measure alone lends us in the treatment of malnutrition.

Then consider the pain-allaying resources of electricity, the comfort beyond words that we can make certain methods of administration produce. Then consider the assorted symptomatic vagaries of lithæmic sufferers and realize the service rendered by methods of electrical application which will take them all away for the time being, and will gradually keep them away under persistent treatment.

And in contrast picture the many medicinal agents used in lithæmia which—used alone—prove broken reeds to lean on. But there are a few splendid drug palliatives in these states, and when to their aid we bring the efficient actions of electric currents the patient can receive benefit far beyond the power of any other plan of treatment. No drug is curative of gout. No mineral water is a specific. Diet is a mere dodging of the issue. Colchicum is a palliative of the pain and not a cure of the nutritional defect. The only true treatment of deep-acting, genuine, and lasting value consists in the addition of the best resources of modern electrical energies to the best measures that have hitherto benefited the given patient.

# CHAPTER XVI.

## THE RHEUMATIC CONDITION AND THE URIC-ACID DIATHESIS.

Showing the Numerous Muscle and Joint Pains and Morbid Processes Grouped Under the Name of Rheumatism. An Explanation of the Correct Principles of Curative Treatment.

THERE are two broad distinctions in the application of this word —one *muscular* and the other *articular.* Articular rheumatism involves the joints and is divided into several kinds—acute inflammatory rheumatism, chronic arthritis, arthritis deformans, etc., which we will consider after we discuss the muscular type.

Muscular rheumatism is also called *myalgia*, and when it affects certain regions it is called by special names such as lumbago, torticollis, pleurodynia, cephalodynia, etc. This is the familiar and painful affection of the voluntary muscles and of the fasciæ and periosteum to which they are attached, which follows exposure to a draught of air or sudden chilling after heating exertion. The stiffness and pain on muscular movements are local and there is no fever; the articular affection is systemic instead of local and is an entirely different disease and the two ought not to be given the same name.

To one who commands the modern resources of electric currents (including electric-light radiations) no part of medical literature is more farcical and more unjust to the patient than the teachings of standard text-books under treatment of muscular rheumatism. Blisters, liniments, plasters, needle punctures, thermo-cautery, morphine, etc., become grotesque in the presence of electro-therapy. As the result of long, personal experience the author herewith affirms that if electricity is properly applied to muscular rheumatism and fails to give satisfactory results the patient has some other disease and *not* muscular rheumatism.

Nothing in medical therapeutics is more certain than the absolute relief to all forms of *myalgia* which can be decisively produced by electrical treatment—not by a cheap faradic battery and short coil, nor yet by any sleight of hand, but by *work* and with the right tools. Often we have banished the stiffness and pain from a new lumbago in one minute, five minutes, or ten minutes, and on a stubborn case of twenty years' recurrence, deep-seated in the spinal fasciæ, we have fought out a battle of fifty minutes before the patient could bend to the floor and twist in all directions and be unable to cause a sign of pain.

In a severe or chronic case the first relief takes longest, and the second and third treatments take less time. And although this infirmity—as are all results of "colds"—is liable to recur, yet the word *cure* may properly be applied to the final effects of electrical treatment. Compared with other methods these curative effects are obtained with exceeding quickness.

Taking cases as they come, recent and old, mild and severe, the full resources of electrical equipment afford the greatest pleasure to the operator and to the patient. The Radiant-heat bath is of immense advantage, the deep action of a fine induction coil outclasses all the plasters of the pharmacopœia, the high-potential currents almost master every case single-handed, and vibration and the Tissue Oscillator finish the work. And in all this work on muscles the method of *posturing* originated by the author greatly governs the effects, and the non-use of his teachings accounts for many of the failures set down to electricity. The remedy is all right, but it needs the right technic behind it.

The same remarks apply to *cramps*, which some have in the calves of the legs, some in the abdominal muscles, and some in the side or elsewhere. They are annoying and are the spasm of an irritant in the part. There is practically no direct means of overcoming them save by electrical treatment, and electricity has not yet failed in any case that we have so far met.

Acute rheumatic fever—inflammatory rheumatism—acute arthritis,—we leave entirely out of consideration until the patient recovers enough to get out. For only subacute and chronic states of this disease can attend the physician's office where his electrical currents are installed.

Rheumatism of the *joints* of the plain variety, known to physicians as *chronic rheumatism*, manifests itself directly in the synovial membranes, the capsules, and ligaments of the joints and in the sheaths of tendons in the neighborhood. It is not a primary disease of the joints, but is rather the effect upon them of a condition of the general system in which the physiological functions of combustion and elimination are imperfectly carried on. This fact makes clear the rational basis of action which makes the resources of electricity indispensable in treatment. And if any one thinks it fanciful to allege that electricity is the greatest of remedial agents in this disease we have but to present in comparison the value of other remedies. Says a classical treatise on the subject:

> "The prognosis is not favorable, as the majority of cases resist all methods of treatment. It persists indefinitely. Internal remedies are of little service. It is important to maintain the digestive functions and to keep the general health at a high standard. Iodide of potassium, sarsaparilla, and guaiacum are sometimes beneficial. The salicylates are useless."

These are cases that also require *work*—not a prescription, but work on the entire local and general condition, and one "electric battery" of any kind will do but little. Yet in the whole range of difficult diseases few can be more gratefully improved than can chronic rheumatism if, in the worst cases, time is allowed and a full equipment lends its resources. The whole state of the body calls for elimination and an alteration of nutrition—and for these actions no agent equals electricity. No other agent is so safe and sure a pain-reliever. No other agent can so well tone up the faulty functions and reduce the circulation of irritant products to a minimum. No other agent can do so much to restore the impaired energy of muscles and enable exercise to add its influence in keeping the patient as vigorous as possible. And the foundation benefit on which all other improvements are based is the surpassingly efficient elimination of the luminiferous radiations of electric light. Read the entire list of other remedies—drugs, the Paquelin cautery, massage, climate, hydrotherapy, Turkish baths, Hot Springs—and then turn to the *physiological actions* of the full scope of electrical energies and note their relative efficiency. It will be seen at once that writers who adhere to the old methods are behind the age.

The most difficult cases to help are those which have persisted for twenty or thirty years and by involvement of all the principal joints have crippled the patient into a practically helpless state. One such case we met in our early practice. She had spent twenty-five years in sanatoria and spas, no treatment doing her any appreciable good. With more modern facilities we often feel that if we had the opportunity again she could be benefited materially.

Rheumatic *headaches* are happily amenable to the action of electric currents. Rheumatic derangements of circulation and deficient bodily heat are favorably affected by means available in electrical treatment. Practically all the troublesome symptoms associated with chronic rheumatism will gradually disappear during the course of treatment, and few cases will so resist the actions of electricity as to fail of material improvement in a single month. One of the first improvements brought about is in a better action of the kidneys and an increased excretion through the urine. The value of this need not be dwelt upon.

Another class of rheumatic conditions arises from the circulation in the system of the virus of *gonorrhœa.* This implacable venereal diseases is held to be responsible for 80 per cent of the business of the gynecologist—the pelvic diseases of women—and it pursues men in devious and various ways to an extent that has led some veteran specialists to say that no case can ever be absolutely considered cured. One of the enterprises of the celebrated gonococcus of Neisser is the establishment of a form of *arthritis*—articular rheumatism—of which variability and obstinacy are the two most distinguishing features. But, just a moment about the cause: The present dean of American physicians, in his classical text-book on the Practice of Medicine, begins this subject thus:

> "Gonorrhœa, one of the most widespread and serious of infectious diseases, presents many features for consideration. As a cause of ill-health and disability the gonococcus occupies a position of the very first rank among its fellows. While the local lesion is often thought to be trifling, yet in its singular obstinacy, in the possibilities of a permanent sexual damage to the individual himself and still more in the 'grisly troop' which may follow in its train, gonorrhœal infection does not fall very far short of syphilis in importance."

In regard to the treatment of gonorrhœal rheumatism another medical authority has the following to say:

> "Medical treatment is very unsatisfactory. We have never found the salicylates, colchicum, the iodides, or the mercurials to exert a distinct influence for good. In the acute cases, rest, fixation

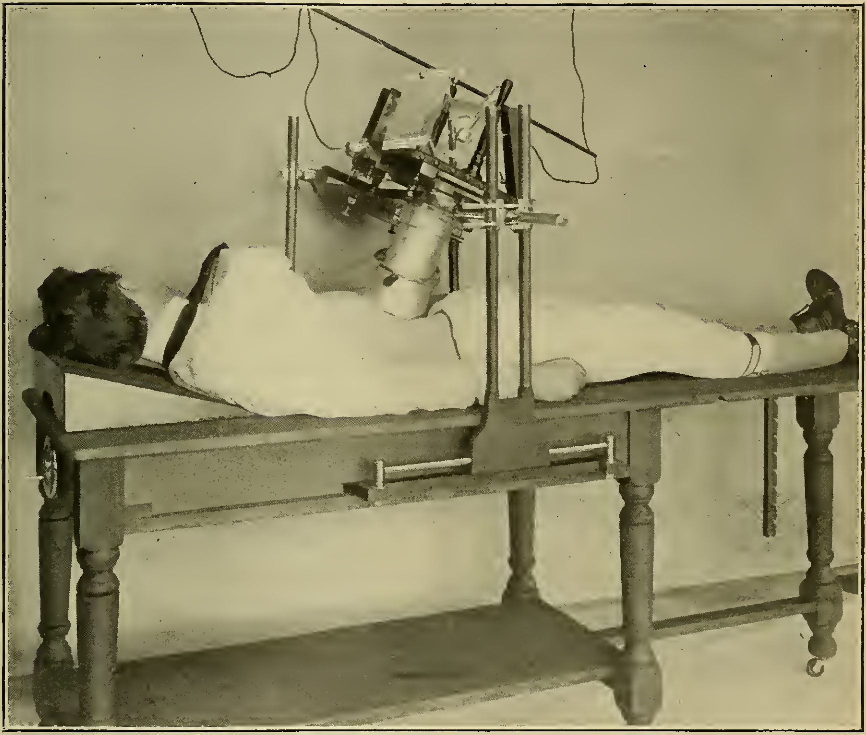
of the joints by splints and blisters, or the application of the thermo-cautery over the joints, constitute the major parts of treatment. In chronic cases careful attention to the general health, the best possible hygienic surroundings, the administration of tonics and arsenic, and the use of massage and passive movements, comprise about all that can be done by the physician."

Many of the writings in medical literature remind us of a horse in *blinders*, seeing nothing but the road ahead of him. A broader view of the landscape would show that there was more than macadam in it. And so it is with some of the routine medical teachings —the writings of men who have looked into nothing but the drug-store and who shut out all knowledge of electrical progress by a pair of the densest of known blinders—one of them *bigotry* and the other *prejudice.*

The victim of gonorrhœal rheumatism urgently *needs* the aid of electro-therapy and can seek this remedial agent with a great deal of confidence. The range of extension and severity, however, is wide. We have seen a young man, affected only in the feet, given relief for three months by two treatments, even though he was scarcely able to walk from pain at the time of his first electrical treatment. Three years previous he had spent four months at Hot Springs where no electricity was used, and he would never go back there again. When a new attack threatens he now seems able to hold it in check by a single treatment taken at long intervals of time. Many mild cases obtain quick relief from a very few treatments.

But this disease can be a different story. It can invade many joints. It can waste the person forty per cent of his weight. It can produce profound suffering and extreme debility. And under these circumstances—if patient and apparatus can be brought together—the best results can still be most quickly obtained by the same electrical resources (the same electricity) that avails in the simpler cases. But to the man so afflicted, patience is a virtue that must be cultivated if he has it not.

What the laity calls "White Swelling," say, of the knee, is professionally termed chronic *synovitis*, and has its efficient remedy in electric currents. And the same may be said of any sporadic manifestation of a rheumatic character anywhere in the body. By suitable methods and selected current action, electricity becomes almost the only remedy to seek.



MANNER OF RADIOGRAPHING A KIDNEY STONE WITH THE COMPRESSION DIAPHRAGM APPARATUS

Until this scientific instrument of precision was invented the detection and localization of stones in the kidney was uncertain and unsatisfactory. This device fixes the part immovably, reduces the thickness of tissues between the tube and the sensitive plate, centers the field in the exact axis of radiation, and secures the utmost possible accuracy in the picture.

One further form of obstinate chronic disease of the joints is known to medical writings as rheumatoid arthritis, rheumatic gout, and as arthritis deformans—the three names signifying the same condition. It is slow, crippling, characterized by changes in the cartilages and synovial membranes, with periarticular formation of bone, and great deformity. Some hold that it is in reality neither rheumatism nor gout in its peculiar etiology but is either an arthropathy of nervous origin or a chronic infection. Whichever it is, electricity is the only remedy worth the attention of the physician.

In one of our former text-books for the instruction of physicians we have gone into this subject at some length and cited cases and results, but it is useless here to dwell upon a comparison of different remedies and discuss their value and the reverse. What the resources of up-to-date electrical methods can accomplish for the relief, improvement and restoration of these cases to partial usefulness cannot be approached by all other agents in the materia medica. Resting the subject with this affirmation of long personal experience we take up the matter of *uric acid.*

Scarcely anything in modern medical history has attained a greater vogue than the "uric-acid theory" of Haig. The Uric-Acid Diathesis has been accredited with thirty-nine separate morbid conditions, but is losing a little ground and may be less fashionable in a few years. The headaches of this diathesis are famous.

The person who has any degree of this condition need not follow various disputants in their theoretical conceptions of exactly what the uric-acid state and its causes are. It is enough to comprehend the main fact that certain symptoms arise in connection with defective food or tissue metabolism, more particularly of the nitrogenous elements, and that deficient oxidation is probably the most essential factor in the process. This faulty metabolism, if long continued, may lead to gout, uratic deposits in the joints, acute inflammations and pathological changes in the heart, arteries, and kidneys. The chief contributing cause of an excess of uric acid is over-eating or drinking with too little muscular exercise to burn up the amount of food, though in many cases no over-eating is apparent.

To any reader who studies our chapters upon physiological actions of the different electrical energies the nutritional disturbance which lies at the base of "uric acid" calls unmistakably for proper electrical treatment. And the only genuinely curative remedy is electricity. There are drug palliatives but no decisive drug cure.

Lest it may be said that we write on this matter without due knowledge of experience we shall here offer in testimony of our views an extract taken from one of our former writings published May, 1897.

> "The medical man who operates a powerful Holtz machine in his office practice possesses a means of mastery over this renowned condition that far surpasses the therapeutics of Haig. The diet-and-drug method strives to adapt the patient to the diathesis, in fact capitulates to it. Supplementing these measures with Static electricity *drives the diathesis out* and necessitates no compromise with the powers of malnutrition.
>
> "Nerve and muscle excitation are the familiar electrical effects commonly quoted by those who have no other knowledge of electro-physiology, but these are far surpassed in nutritional importance by the decisive effects upon the metabolism of the organism produced by currents of high frequency and high potential. Apostoli and D'Arsonval have lately demonstrated, and many others have confirmed, this profound effect upon nutrition, increasing the elimination of urea, carbonic acid, and water, by from forty to fifty per cent and reducing by a corresponding amount the uric acid in the system.
>
> "On the one hand the consumption of oxygen is increased, metabolic completeness is increased, and the products of incomplete combustion are diminished on the other hand. It is certainly better therapeutics to dispose of uric acid by carrying its oxidation on to urea than to prescribe solvents which do not lessen its production and which only palliate the evil."—(*From "Manual of Static Electricity in X-Ray and Therapeutic Uses,"* by *S. H. Monell, M.D.*, 1897.)

Experience since the above was written amply confirms its truth. With newer resources in electrical energies and improved apparatus of all kinds we obtain still better results than before. Electricity does not act with the celerity with which a chemical alkali will neutralize an acid, but the trouble with an alkali is that the acid reappears next time about the same as before. Gradual improvement of nutrition, however, with sufficiently regular electrical treatment finally corrects the fault at the fountain head and while the patient is careful he will remain well. But just as a person can catch a second cold at any future time after the cure of the first, so the derangement of nutrition can again be induced by errors in habits and diet or manner of eating—for it is not so much what we eat as how we eat it; and Americans tend to eat too fast.

# CHAPTER XVII.

## THE OBNOXIOUS CACHEXIAS OF QUININE, MERCURY, THE IODIDE AND BROMIDE COMPOUNDS, AND SEPTIC ABSORPTION OF PTOMAINES.

Showing How the Much Taking of Drugs in Malaria, Syphilis, Epilepsy, and Other Chronic Diseases Produces Cachectic States of the Blood and Tissues. The Septic Absorption of Toxins from Suppurating Lesions. The Benefits of Elimination and Restorative Tonics.

ALL who have travelled through a swampy region, pregnant with malaria, have seen the veteran inhabitants—sallow, jaundiced and gaunt; that is "cachexy."

In the dictionary it comes from two Greek words, one of which means *bad* and the other *state;* hence, "a depraved state of the system, as from cancer or syphilis" (Webster). In real life it comes from the gradual poisoning of the system by *un*-eliminated, retained depressants of the functions—either the septic products of disease, or the auto-intoxication of incomplete excretion, or the injurious retention of certain drugs which are taken in excess of the tolerance of the liver and blood-making organs.

Thousands of cachectic people walk the streets of every city in the land, but there are many grades of this prevalent "depraved state," and some scarcely recognize the *malaise* while the worst of them think there is no remedy. But the efficient remedy is contained in the sum of electro-therapeutic resources, two of which —electric-light radiations and high-potential currents—will deal successfully with the majority of cases.

Quinine does its most perfect work in the treatment of acute intermittent fever. The chronic use of this drug for chronic malaria, especially in the doses which many take, is not seldom a serious complication to the disease. Quinine acts in a definite manner on certain constituents of the blood—on the hæmoglobin (red coloring matter), impairing its power to transport active oxygen (ozone) into which the ordinary oxygen of the air is converted; inhibits or lessens the activity of the white blood corpuscles, and indeed destroys them, or arrests their production, affects the heart, large doses depressing the circulation and lowering the vascular tension. Increased cutaneous secretion (as should result from active exercise), is prevented by large doses of quinine. It depresses the functions of the sympathetic nervous system.

The acute disturbances of a massive dose are familiar to all who have ever taken one, but we call attention to actions which are less known to the public, to explain the cachectic-producing qualities of this great drug. The functions of the liver are depressed by its chronic use. In the typical *facies* of the ague districts, it is a question how much of the sallow, cadaverous appearance is the miasmatic poison and how much is the poison of quinine. But we need not seek to discriminate in the selection of a remedy for both, for we find it with equal certainty and at the same time in the eliminating Light-bath and the tonic properties of high-potential currents.

And right here seems a good place to present some general facts of atmospheric electrification which have a bearing on our spirits and our health, for in *negative* states of the atmosphere some of us feel depressed, and in *positive* states most of us feel brighter. Without further reference to malaria than to say that the chronic cachexia is a decidedly negative condition and that electro-positive regions are generally free from this *miasm*, we will briefly quote from a pamphlet on the subject, written in 1894 by the author of this book. Before cinchona—Peruvian bark—was much used in England for ague, electricity was demonstrated to be of greater value than any other drugs, and with modern means of generating more efficient currents we still find it the chief remedy—after the acute stage. What follows will doubtless be new to readers though written long ago.

"That we are every day bathed in an atmospheric electric bath, is scientifically established. Professor Elihu Thomson demonstrates that as we rise from the earth's surface to different altitudes, there appears to be a gradual increase of potential with respect to the ground, so that at one thousand feet there may be ten thousand volts difference between the air at the top and at the surface; and this difference may increase as we reach higher altitudes.

In low, damp, *malarial* regions it is found that the atmosphere is electrified *negatively*, while the higher we go the more *positive* does the atmosphere become. Dry, clear, cool, sunny, rarefied, high (positive) altitudes are recognized as a stimulating combination of climatic attributes, which we would select for a large class of invalids, including those of phthisical tendencies, and as a tonic and restorative for persons suffering from overwork in business or professional pursuits, and who have no real organic disease. Accordingly, we should select also for these patients the positive pole for general static treatment.

"There is another not unimportant thought in connection with this idea, which relates not so much to the character of a climate as the influence and effect of a *change* of climate; and, to a certain extent, this can be effected by static (positive or negative) electrification. Though we can scarcely affirm that a change of climate is a specific remedy for any disease, yet the benefit which it frequently produces, in assisting the reparative powers of nature, is a matter of world-wide observation. Change of climate, however, is an exceedingly relative phrase, and need not necessarily involve an expensive and difficult journey, with the deprivation of accustomed comforts and a residence among entire strangers. Dr. E. I. Sparks well says 'that a few-mile journey from the town to the country, from inland to the seashore, from the plain to the mountain, often suffices to produce marked results.' But while it is impossible for every one to travel in search of health, we have in the static machine a means of providing something of that element of contrast in the daily electrical and atmospheric environment of the individual which is the great incentive to a journey.

"No one can doubt that the natural electrical conditions of the air we breathe influence health. Scientists assert that all atmospheric states which have been observed to have an unfavorable influence upon health are accompanied by an increase of *negative* electricity in the air. It is well known that before a thunderstorm an indescribable sense of malaise and oppression is felt by many individuals, and especially by those of a delicate nervous temperament or subject to rheumatism, neuralgia, etc.

"At such a time the atmosphere in the neighborhood of the earth is surcharged *negatively*, and the common expression that a thunderstorm clears the air is scientifically correct; the equilibrium of the two forces of electricity being restored by the exchange in the visible form of lightning between the lower negative and the upper positive layers of air.

"The state of the electrification of human beings in normal health is almost invariably found to be *positive.* Many of the good results derived from static electricity during its flourishing period in the eighteenth century, when it seemed to perform the most miraculous cures, probably were due as much to the positive electrification as to the now obsolete 'shocks,' which were then deemed necessary, since Ramsden's machine, which was introduced in 1760, and for long afterward was in common use, would administer only a positive charge when applied in the ordinary way.

"The *positive* charge is therefore of primary significance in general debilitated conditions from infancy to old age, whether the result of exhausting illness or drain upon the system, or overwork, anxiety, excessive lactation, suppuration, impaired nutrition, social dissipation, functional derangements, or mental states such as hysteria, melancholia, hypochondriasis, nervous insomnia, etc. In regard to its influence upon malaria Dr. Maddock observes:

"'In my experience I know of no more valuable feature of static electricity than its power to help eliminate malarious conditions from the system. It has been universally admitted by scientists that in malarial districts the air is electrified negatively. Following out this thought, I reasoned that owing to the greater conductivity of the air, due to moisture, people residing in paludal districts were deprived of an adequate supply of positive electricity. Acting upon this, I have for years employed the static machine by positive insulation in every case of suspected malarial origin, and the results have surprised myself. At times, before I obtained my present machine, I was, owing to atmospheric influences rendering the generation of electricity in any sufficient quantity impossible, tempted to abandon this form of treatment, but in over a year and a half I have never been disappointed in getting quantity and quality to meet all demands.'

"When a person is simply 'run down,' 'overworked,' and 'fagged completely out,' but unable to leave business and seek a change of climate, our daily experience confirms the belief that the alterative and stimulating effect of electrification embodies the potential benefit of a climatic change, sea voyage, and rest; and it may be remarked that the atmosphere surrounding a patient seated upon the insulating platform of a static machine, is richly charged with ozone, which the electrical action rapidly generates, and which, inhaled by the patient during treatment, no doubt contributes to the beneficial results."

In our own professional experience we have successfully treated the chill stage of an attack—aborted it—and have greatly hastened recovery from an acute malaria, and have greatly improved the condition in the chronic cachexia, and we would not like to be without the aid of electrical resources in the treatment of these conditions. The elimination of the Light-bath is of immense value in all stages.

In principle the same philosophy applies to the locking-up of insoluble mercury in the liver and glands in the long combat with that strange venereal nemesis which pursues its relentless course from the Hunterian chancre to the *gumma*—on the way producing more lesions of the nervous system and more necrosis of bones, and a greater variety of insidious damage than any other single gift of disease to man.

Iodide of potassium also joins with mercurials in the third and even the second stage of the treatment of syphilis; and in increasing and massive doses this drug is one of the most remarkable things in medicine. The subjects of syphilis in its constitutional form emaciate, and their forces are depressed. In health the iodides increase waste of tissue substance and the elimination of the products of waste, and cause a general depression of the vital functions when administered for a sufficient time. But when the destroying *virus* and the tissue-destroying drug meet, the virus is eliminated, the organism reacts, constructive metamorphosis resumes and a gain in body-weight is the result—the attack of the disease upon the tissues is arrested for the time being.

But although the teaching of syphilographers is simple in theory, yet in practice the treatment of the patient who has the disease is often a troublesome matter—for he has also salivary glands, digestive organs, a liver, and mucous membranes which may conflict with the popular drugs and set up such unpleasant complication as to annoy the doctor.

Therefore, as an aid to the administration of "mixed treatment," the resources of electricity are invaluable. As the means of relieving disturbing symptoms they are beyond price. As the sufficient and practical means of carrying out the plan of the "tonic treatment of syphilis" they have no equal. As the means of sustaining the patient in the syphilitic cachexia and most rapidly assisting in restoring the sound state they are potential adjuncts to the great twin drugs.

The vogue of Hot Springs and resorts which have acquired celebrity for the active treatment of these conditions rests upon the elimination of the baths as a support to the administration of larger doses of the drugs. But with the alterative-tonic-nutritional elimination of electric-light and radiant-heat baths even greater benefit is possible anywhere. The modern treatment of syphilis is certainly placed upon a new footing by the auxiliary resources of electrical energies.

When we consider epilepsy we often have even a worse state of drug cachexia to combat. It is becoming the consensus of medical opinion that the once-lauded bromides are a curse instead of a benefit in the long treatment of patients with this disease. At best they are only palliative, and the depressions they produce have led a number of neurologists to reject them in modern practice. A personal hygiene of outdoor occupation and the tonic resources of nature, has displaced the former drug routine in the hands of leading specialists. This at once suggests the tonic and nutritional aid of electrical resources.

As a matter of fact, cases of epilepsy have been treated, and with more success than with drugs, since the early days of electro-therapeutics. It is an uncertain disease and one in which the exact benefit given the patient is hard to measure.

But now we reach a condition much more definite, and one in which there is no doubt or mistake about the benefits of electricity —for there is no rival to its action. When a long-lasting suppurative process—for instance, an ulcer of the leg with necrosis of the tibia—drains the vitality of the patient for years, it does part of its damage to the system through the chronic absorption of sepsis into the blood. The blood then becomes the vehicle of distribution throughout the body, and the man becomes in time swollen, pasty, and white—his tissues losing their normal tonicity, pitting on pressure, anæmic, starved of oxygen, and unable to heal. The man is a victim of chronic blood-poisoning.

We knew a lady, guest on a summer yacht party, who ate oysters in August. She was poisoned by ptomaines, was very sick for a few days and it took her seven years to outgrow the effects. A young man summered on Long Island and rode a bicycle for exercise. Mosquitoes lit on his legs and bit through the loose weave of bicycle stockings. He scratched the bites. His nails poisoned the skin. An eruption followed. From more scratching the pimples festered. His leg absorbed the poison, swelled, and an acute inflammation set up. For two years he had recurrences of ulceration on his leg, and successive boils on different parts of his body—some thirty-nine in all.

His treatment during the two years consisted of the local application of antiseptics and bandaging, antiseptic local baths, diet, internal medication and a course of fourteen Turkish baths. His condition would improve and then relapse.

Finally he consulted the resources of electro-therapeutics, and by the eliminating aid of Light-rays, and the nutritional-tonic actions of proper high-potential treatment he recovered an entirely normal state of health.

These, and many more in our experience which lack of space compels us to omit, illustrate the class of septic absorptions for which there is no remedy like electricity. In the acute septicæmia and pyæmia of the surgeon we have had no opportunity to test the value of these resources as such cases are hospital practice and cannot attend the physician's office. But in chronic conditions the remedy is sovereign and decisive.

# CHAPTER XVIII.

## THE DECISIVE TREATMENT OF DIABETES AND DISEASES OF THE KIDNEYS.

Showing the Curable Nature of these Diseases in Their Early Stages and the Benefits of Electrical Treatment when They are beyond Cure.

THE first impulse of the non-medical reader will be to say that electricity cannot help the victim of Bright's disease or diabetes. Nor *can* a "family battery." But when we make clear the character of these diseases we shall all of us see that certain nutritional and reflex actions of certain methods of administering certain electrical energies *fit these conditions as a glove fits the hand.* Still more, from study of these diseases we shall speedily realize that medical science contains no decisive remedy except electricity—that not only is it the chief curative agent but it is *the sole existing means of obtaining even the hope of cure.* It is charlatanism indeed to advertise "electric insoles" as a cure for disease of the kidneys, but the efficient resources of scientific apparatus and skilled technics are a different matter.

There are two types of diabetes. One of them is rare—a vasomotor disturbance of the renal vessels due to some local or central irritation giving rise to continuous congestion of the kidneys and causing the passage of large quantities of normal urine of low specific gravity. This type we shall not consider except to say that Dr. Clubbe reported a case of *diabetes insipidus* in the London *Lancet*, which was improved by electrical treatment fifty per cent in six weeks, the urine being reduced from two hundred and thirty-seven to one hundred and thirteen ounces per day, and a few other cases have been benefited by high-potential currents.

But *diabetes mellitus* is common and of great interest. It is defined as "a *disorder of nutrition*, in which sugar accumulates in the blood and is excreted in the urine, the daily amount of which is greatly increased."

That it is a disorder of *nutrition* indicates at the start the principle of curative treatment—the restoration of the deranged function to normal. But the cause of the metabolic fault is various and when a supposed cause can be suspected treatment should be directed to its removal. There is a disturbance of the glycogenic function of the liver, but why?

Two views obtain the best support of medical opinion: One that the disease is a neurosis, the changes in the circulation occurring under nervous influences; and the other, that it is the result of disease of the pancreas—the white, conglomerate gland lying deep in the abdomen behind the stomach and pouring the important digestive ferment it secretes into the intestinal tract during digestion. The "sweetbread" is the pancreas of the calf. The pancreatic digestive ferment has greatly to do with the normal digestion of sugars and starches, hence when disease of the gland suppresses the formation of the ferment we have the waste of sugar which is the *glycosuria* of the diabetic.

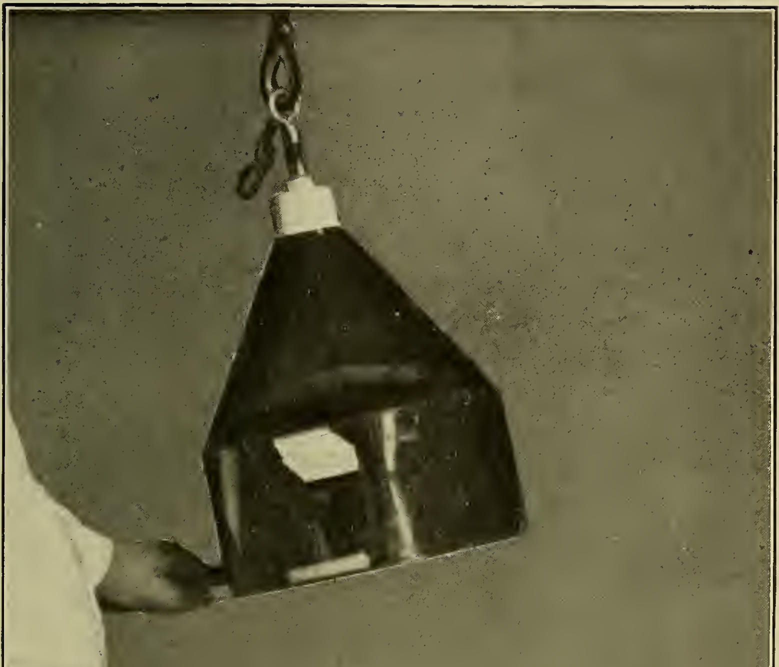
The pancreatic lesions observed have been chiefly some degree of atrophy, and fatty degeneration. The neurotic condition, when present, has been that of irritation, and experimental irritations of the medulla are followed by glycosuria.

Passing over the description of complications and symptoms we at once revert to treatment, which is the important thing the patient wants.

The net sum of routine treatment is almost entirely included in the word *diet;* and the injunctions of one hundred and fifty years ago are still the advice of to-day. Of medicinal treatment, Osler writes: "This is most unsatisfactory, and no one drug appears to exert a directly curative influence. Opium alone stands the test of experience as a remedy capable of limiting the progress of the disease."

The attempt to meet disease by an unbalanced diet has the grave objection that in time it still more unbalances the system and so far as it is a semi-starvation of vital constituents it creates a worse condition than before. And the strict anti-diabetic diet is, so far as our experience enables us to judge, a useless hardship, without ultimate benefit, and an injury when the patient is treated with electricity.

With so little competing value in medical agents we need not claim much in behalf of electro-therapy to give it prior consideration. Yet a great deal can be claimed for it. In 1895, a lady



A 500 CANDLE-POWER INCANDESCENT LAMP

This shows the method of applying light rays through a part under treatment. The clinical uses of this type of therapeutic instrument are increasing rapidly, and it is one of the necessary instruments of the modern physician.

called upon the writer with reference to her husband who had diabetes. We assured her that we did not know how to aid him with electricity—in fact, we were not aware that it could be done. About six months afterward a patient under treatment required an examination of the urine and the pathologist to whom the specimen was sent reported that she was in a "very grave condition" with diabetes and advanced interstitial nephritis (inflammation of the kidneys) and the prognosis was bad. On talking with him later he expressed the opinion that she would not live more than a month.

She is alive yet. Her steady improvement under regular electrical treatment interested us in the possibilities of the case. An examination of her urine in four weeks showed the albumen and casts reduced and sugar absent. She gradually gained a fair degree of health and for several years she came for a few treatments as occasion rendered advisable. Since then an ampler study into the *rationale* of all disorders of nutrition, and their relation to the regulation of functions by means of electro-therapeutic resources, has made the results in the above case seem far less remarkable than we first deemed them. They have become an ordinary experience.

In the lesser degrees of diabetes mellitus we have never failed to cause a removal of the sugar from the urine since 1896, and the value of this agent is demonstrated by an increasing number of physicians. As there is more than one cause of the disease it is impossible to assume that all cases will be arrested by electricity, but that it is the *only curative* agent in sight is evident enough to all who are competent to judge. No late stage of the disease—the very advanced stage when it is almost certainly hopeless—has yet given us an opportunity to test the possible actions of electrical resources, either as a comfort to symptomatic suffering or as an attempt to influence the sugar. But we should like to try it.

Every European physician who employs High-Frequency currents reports successful results in diabetes, and the treatment of ordinary cases of this once incurable and still uncertain disease has passed into the long list of the triumphs of electro-therapy.

Acute *inflammation of the kidney* can occur from exposure to cold, and is also one of the sequelæ of a number of diseases—diphtheria, scarlet fever, typhoid fever, erysipelas, malaria, syphilis, etc. In these cases, while the patient is confined to the bed or house, rest and medical treatment is the necessary practice. But healing of the kidney may not go on to a complete restoration of the normal state of these essential organs, and here electricity steps in with a decisive means of carrying the process of cure to a proper end. It is so certain to do it that if it should fail—and with us it never has—we should at once seek for some grave and hidden cause.

The technique and current required have been worked out by experience, and while the reflex action upon the kidney shows definitely in the urinalysis, the patient at the same time is given the general building-up which is always desirable in convalescence.

In the *albuminuria of pregnancy*—often making this term an anxious period for the physician—the resort to a milk diet tends to clear the system of irritants and relieves the patient, but it is (as all similar dietetic schemes for nutritional disabilities are) a palliative dodging of the issue rather than actual remedial treatment. The resources of electricity permit the patient to regain a normal diet with the least delay, and in pregnancy this is important. Electricity not only rescues the patient promptly from the fear of uræmic poison, but if used at every fresh disturbance of functions will, with regulation of the bowels and digestion, carry the period of gestation to an end with the greatest possible amount of comfort. Women who are deprived of its really marvellous ministrations to their functional processes during pregnancy have no idea of what they miss.

*Chronic nephritis*—inflammation of the kidneys of long duration—follows, in many cases, the acute attacks referred to above. And this makes it of the utmost importance to finish the process of recovery without delay. A complete convalescence is priceless, and our chapter on that important period should be read by every one. The disease, more frequently than is usually known, has an insidious onset without any febrile attack that the patient is aware of. The prognosis is extremely grave as regards the parenchymatous form, and both it and the interstitial form are medically incurable.

Regarding medical treatment it is instructive to cite from standard text-books the results of long experience in diseases of the kidneys, and what follows is taken from the best of recent publications on medical practice.

"Of acute Bright's, one author says: 'For the persistent albuminuria, I agree with Roberts and Rosenstein that we have no remedy of the slightest value. Nothing indicates more clearly our helplessness in controlling kidney metabolism than inability to meet this common symptom.''

"Of chronic Bright's the same author says: 'Essentially the same treatment should be carried out as in acute Bright's disease.' Again he writes: 'Chronic Bright's disease is an incurable affection, and the anatomical conditions on which it depends are quite as much beyond the reach of medicines as wrinkled skin or gray hair. Mineral waters have no curative influence.'

But the clinical history of kidney disease of these types shows that we have that important thing to consider known as the *patient*. The patient is subject to many symptomatic disturbances, and by selected electrical resources we can correct them with almost absolute certainty without taxing the system with drugs. Patients are apt to have very thin blood, the vessels become badly nourished, arterio-sclerosis develops, the heart suffers, effusions occur if there is too low arterial tension, becomes extreme, and remains too long without lowering.

Diet, an equable life, freedom from worry, etc., are admirable in text-books and are strongly recommended for the above, but electricity will do better. Selected technics are directed to improving the general functions, the vascular condition and the nutrition of the renal organs (renal simply means kidney). Among the resources of electrical energies the newer appliances using electric light are serviceable in ways entirely beyond the reach of drugs or diet. Part of the value of light-rays in these cases lies in the abundant diaphoresis which is established by the radiant-heat bath, but equally important benefit is also obtained by direct feeding of the tissues with rays which promote the oxygenation of the blood.

The nutritional improvement of the internal organs resulting from the regulation of functions by high-potential electrical resources not only removes the necessity for high arterial tension and regulates the blood pressure more normally, but it must be assumed to check the degeneration of that formidable arterio-sclerosis which is the bane of the late stages of this disease. With improved blood and improved functions the arteries must better feed their own walls and retain more of their essential elasticity.

We cannot overestimate the value of these services of electric currents in these cases.

We have seen before in this chapter that although for the persistent loss of albumin " we have no medical remedy of the slightest value," yet electricity can be so used as entirely to check the loss or reduce it to a fraction of its previous amount. And if this is done it is a great gain for the patient.

And with the aid of electricity also the patient escapes from the trammels of dietetic slavery. In all the cases of chronic kidney disease we have treated we have advised the patient to enjoy a full mixed and rational diet, as we agree with the dictum of Hare, enunciated nearly twenty years ago, that the condition of chronic Bright's is a partial starvation and to starve it further by a restricted diet is to advance the disease more rapidly to its end. We can see no reason to think that a nourishing diet disagrees at all with the patients we have treated with electricity.

Therefore, from the accepted standpoint of medical teachings and the inefficacy of drugs, it seems to us that the treatment of non-suppurative inflammatory diseases of the kidney without the resources of physiological therapeutics is an almost unthinkable proposition.

# CHAPTER XIX.

## WRITER'S CRAMP, TELEGRAPHER'S AND TYPEWRITER'S PARALYSIS, AND ALL FORMS OF LAMENESS FROM OVER-USE OR STRAIN OF MUSCLES.

The Explanation and Principles of Cure of the So-Called "Occupation Neuroses," Including the "Glass Arm" of Famous Base-Ball Pitchers.

UPWARD of thirty thousand persons in the United States suffer from this affection—including the writer of this book. A lot of misunderstanding exists about it and some plain information is desirable.

When a healthy person fatigues his arm by unusual work for a brief time, the muscles have the power to recover from the lameness and exhaustion by natural rest, especially if aided by a little rubbing. But this natural power of recuperation will not stand too much abuse and has its limitations. If overtax is continued day after day *in excess of the elastic capacity* of the muscle fibres, the nutritive regeneration of the tissues does not keep pace with the *waste of wear*, and rest becomes less and less effective.

The physiological actions of rest are then incomplete, and in time, in severe cases, nature ceases to eliminate the poisons—the toxins of combustion—that result from work, and by remaining in the tissues they irritate and enfeeble the muscle fibres and their nerve-supply so that aches, pains, heaviness, stiffness, lessened rapidity of contraction, lack of endurance, nagging irritability, and gradual "loss of grip," cramp, spasm, and palsy, mark the down-grade of the overworked arm and hand.

When the same set of muscles and the same co-ordinating functions of brain centres work day after day at a rate of speed beyond *the normal endurance* of the person, there develops a chronic state of fatigue which finally becomes a localized "disease," inasmuch as the person so affected cannot restore the function of the impaired muscles to normal by either rest or exercises.

This infirmity was first noticed many years ago among those engaged in rapid and laborious writing, hence the name, "Writer's Cramp," or "Scrivener's Palsy," as it was originally called. It can develop in needle-women, musicians, knitters, milk-maids, tennis players, ball pitchers, stenographers and typewriters, or anybody who persistently taxes certain muscles beyond their capacity to rest as much at night as they waste at work by day. An overbalance of *waste* disturbs the nutrition of the tissues and results in injury.

The most numerous class now affected by occupation in this way graduate from the Press Association Offices of the large cities, where telegraphing on heavy wires at a high rate of speed breaks down a considerable number of men every year. Among the fraternity a partial "loss of grip" is concealed as sedulously as if it was contagious, for a sender's arm is his living and suspicion of it will hurt his reputation—probably, in time, his salary.

Owing to an increasing infirmity in our own arm resulting from severe overtax in 1877–83, we examined (in 1893–94) into the merits of every treatment described during the previous thirty years. Few physicians attempted treatment and none submitted a method of cure. Massage was advocated by the only author who wrote intelligently on the subject—for the neurologists were befogged with theory—and although massage starts on the right track it does not go far enough. A special massage was exploited by a German Writing Master in 1877, and in 1893 gained some notoriety in the newspapers, but after personal interviews with him in this country and witnessing a demonstration of his method it proved to me a mere scratching of the surface—not a deep-acting curative measure.

Medical writers without experience have copied into many text-books the commonplace injunction—meaningless without correct technique—"try electricity." And some tried it and failed to cure. They "tried" for the most part the wrong current, a wrong dosage, and wrong methods of administration, but long and laborious research into the nature and treatment of this disease has convinced us that no physician can expect to successfully treat a bad case of writer's cramp unless he is not only an expert in electrical technics, but is also an expert in understanding this disease.

We have treated many cases—probably more than any other American physican— and have tested every form of current action and every type of current and appliance available in the United States. Of many cases and results we have kept careful notes and by comparisons of effects we have reached the conclusions stated in our different writings on this subject. Independent of the chapter in our large text-book entitled the "Treatment of Disease by Electric Currents" published in 1897 (1,100 pages) we also wrote a special monograph of some 30,000 words in 1898 for the benefit of those desiring information on this infirmity alone.

Our first case, coming to the author for treatment in August, 1893, was fortunately a man wonderfully equipped to aid in clinical research of this kind, for he had suffered complete loss of grip for five years—could not *look* at a telegrapher's key without a cramp—and had vainly tried every kind of treatment he could obtain. His bent of mind was singularly suited to investigation and his native intelligence often aided us in acquiring experience which has passed on its benefits to others coming after. He was entirely rewarded for his patience and was not only restored to work but we kept track of him for six more years and he still remained able to send all day, and with a gradual recovery of his best speed.

At the same time we found that an occasional treatment sufficed to keep our own impaired arm in fair writing condition, and since then it has written upward of two million words, and is writing this book.

The net facts of experience are as follows: "An ounce of prevention is worth a pound of cure," and any telegrapher, typewriter, or penman, who finds his or her hand or arm acquiring a tired ache, with more and more difficulty in maintaining the old vim and speed, can obtain complete protection from loss of grip by taking a week or two of treatment whenever this "advance notice" appears. If the person is in fair general health this will not be necessary very often, for some of our old cases have been working still on a few treatments taken five to ten years ago. But even if it is necessary once a year it is an insurance of moderate cost compared to a loss of position and salary.

In the early stage marked by easy fatigue, with disordered sensations and a failure of the arm to rest itself completely after a hard day's work, *writer's cramp* (and the same condition in any other class of work) is *perfectly curable.* A little later, when distress, a sense of heaviness and perhaps pains appear in the arm the case is still curable but it will take some longer.

When loss of power is the most pronounced symptom, and speed and strength no longer respond to the operator's will, the case is still curable, but it will take a still longer time. When the case advances to the late stage of cramp and spasm and almost a total inability to use the arm at the old occupation, the condition is still curable *if* the patient will persist sufficiently in treatment. As it cannot be fully restored it can be greatly improved.

But, as the disease passes from its recent into its final stages, just so must the period of treatment extend from days into weeks and finally into several months. There is no medicine which will cure writer's cramp and all medical remedies are useless except such as may be needed for other states of the health.

When we speak of electricity as a certain and almost unfailing remedy we do not mean simply "electricity" as an untrained reader may grasp it. Ten years ago we meant the varied resources of three great currents and the best technics we then knew how to use. To-day we mean much more. We have newer and deeper-acting aids in High-Frequency apparatus and the potent nutritional efficiencies of *Light*. This is a fault of nutritional regeneration that we have to deal with—not a neurosis nor a mere nervous debility. No other medical writer has comprehended this basic fact nor grasped the need of *elimination* as the basis of regenerative nutrition—the restoration of nature's power to *rest*.

And it must be obvious to all that if it was possible to bring this condition about by over-strenuous work it will be possible to cause a relapse after even the most perfect recovery of the tissues. But it is less likely to happen than may be supposed, and at the first sign of fatigue a return for treatment can ward it off indefinitely.

Of the efficiency of a single sedative-tonic electrical application to remove the immediate effects of muscular fatigue we have had many evidences in clinical experience, one of which we will cite here. A young lady whom we engaged to copy MSS. of about 300,000 words began the typewriting at her most rapid speed after being without practice on the machine for three years. She worked seven hours a day and at the end of the third day her shoulders were lame and her right hand ached intensely through the palm from the strain on the muscles caused by spacing entirely with this hand. To quote her own words, she felt "As if every word she wrote would be the last she would be able to do," and her hand was, in fact, "completely worn out."

Taking her to the apparatus she was given a treatment which occupied about ten minutes. The relief experienced was absolute and the hand did not bother her again. The single application took away the sense of fatigue, the ache, pain and distress, and during the remainder of the work which followed she had no further need to repeat the treatment.

It is certain that nothing in the way of rest, lotions, massage, or any other form of medical procedure can take an exhausted group of muscles in hand and transform them into a state of natural comfort and functional activity with the energizing celerity of electric currents if they are used properly. But an arm is sometimes over-stimulated by too frequent and too persistent treatment by an earnest physician whose experience is too limited to adapt the directions of text-books to suit the individual case.

One popular medical error should be got out of the mind of any person afflicted with a "glass arm" in any occupation. *Rest* is not a cure. Physicians of all grades, from the family doctor to leading specialists in Nervous Diseases, have the habit of advising patients that what they need is "rest." This advice is the confession of ignorance. Worse advice, advice more profitless to the patient and more unavailing to restore the arm, cannot be given.

In the early stage of fatigue *rest* is a waste of time, for two weeks of treatment will do more than two years of unaided idleness. In the middle stage idleness may stop the arm from getting worse, but on resuming work it is as bad as before and we have never heard of a case that rest cured—and some of our patients had tried it for from one to sixteen years. Mere cessation from work is not physiological *rest* and *cannot* be curative in any true sense. We are certain of this, for we have investigated the effects in many cases. In the later stages rest is a farce as medical advice, for the patient is unable to do anything with it.

Writers who lay aside the pen for years find on resuming that they cannot use it any better than before, and telegraphers who seek other occupations for a year, or ten years, can do little with the key when they attempt it again. In these chronic and paralytic states the arm gets worse with rest and the operator despairs. At the present time a young woman, a brilliant pianist who has overtaxed her arm in the hope of achieving high rank among professional musicians, is "resting" her arm on the advice of one of the (otherwise) best consultants in New York. With patience and blind confidence she has been "resting" it for a year, but the snows of age will fall upon her brow and the ambitions of youth will fade to a fruitless dream unless her arm is rescued by electricity from the state in which it now remains.

Exercising devices of various kinds, advertised and guaranteed to be a certain cure for loss of grip, are ruinous to those who use them, for they add fatigue to what is already an overdose of it.

When the impairment of function is the result of sudden strain, as in the case of a man throwing a ball with an accidental wrench of his arm, the repair of usefulness can be made in a few moments by early treatment, or may take two or three treatments if delayed for a week to see if rest restores it.

The same is true of all kinds of ordinary strains and sprains. The more chronic condition which develops in the arms of ball pitchers is amenable to the same principles of treatment as any other muscular strain and fatigue—and they are all curable. For lack of this information some of the cracks of the diamond field lose exceedingly good salaries and waste a lot of time in the hands of "trainers" who can do little for their infirmity.

The successful mastery of these conditions marks the great difference in action between the physiological influence of the *physical* remedies supplied to medicine by electric currents and the chemical remedies supplied to medicine by drugs. Not as antagonists but as allies these two arms of the physician are equally needed in the combat with disease, but the folly of prejudice has almost made it appear as if internal medication was jealous of the friendly services of electricity. No cause exists for this feeling, and physical remedies are not designed to displace drugs, but to assist the patient over many of the wide gaps yet remaining in the curative powers of medicine. The occupation palsies are one of the gaps that drugs cannot bridge and electricity can.

Let such a patient, with nagging arm and worried mind, working under the tension of this harrowing fatigue, come to electricity for relief. Far from hurting, the proper treatment refreshes, rests and invigorates, not only the lame arm but the whole body, and demonstrates a benefit at each administration that is unmistakable and decisive. The sense of comfort, lightness, buoyancy, elasticity, endurance, and general well-being imparted to an aching heavy and strengthless arm by the nutritional action of electrical energies and the author's technics cannot be obtained by any other means.

# CHAPTER XX.

## THE IMPAIRED VOICE OF SINGERS AND SPEAKERS.

Showing the Restorative Actions of Selected Electric Currents in Removing Congestions, and Effects of Colds, Strain, and Fatigue.

When an operatic gentleman is reported in the press as suffering from a "cold" and hoarseness in this throat, and, in consequence, is deprived of his "$2,000.00-a-night-salary" for several months, a sense of personal loss afflicts the community. None of us enjoy such financial disaster to anybody, but not everyone knows how to avoid it.

A distinguished gentleman in a Western city (to illustrate the general ignorance of electro-therapeutic possibilities) had carried a sprained finger for three months with the means of quick relief at his command all that time—only he did not know it. We then gave the joint a single treatment with the properly selected technic, started into action the functions of the tissues, and the relief gained at the moment gradually developed into a full recovery of the normal state. Before this one treatment he could not entirely flex the finger on the palm. After treatment he could do so with ease; and in about two weeks, and with no other attention to the joint, he considered it well. This object lesson was not lost on him.

A little later he engaged to deliver a lecture in New York. Travel and exposure to cold, wet weather affected his throat and on the morning of the important day he wrote, "My throat is in bad order." At two o'clock P.M. he sent a hurried message, "Throat in bad condtion. Do you advise electricity, and how?" At five o'clock we examined his throat and found the distress, tightness, and aching due to a low grade of laryngitis. And we treated the condition.

The patient then felt that his head and throat were some clearer, but could not yet tell how much, for the physiological actions started by the current would require several hours to mature. The rain continued and he had carelessly not worn rubbers. But in the evening he delivered his lecture.

The next day he wrote us, "The voice came very fine—considering. Very much better than I had hoped for even under *your* treatment. What more can I say?"

These two brief and incomplete experiences did more to awaken his mind to the latent possibilities of medical electricity (with correct technics) than had many years of acquaintance with an unusually large number of physicians—and the additional fact that he was himself a large manufacturer of the very instrument suited in treating him.

As a means of preserving a failing voice which is the owner's dependence for support, the tonic nutritional application of a selected current passed directly through the vocal apparatus and repeated for a few times as often as the need arises, will put off the evil day for a long time. From operatic stars to choir singers, and from dramatic to political and pulpit orators, there are many in the course of each year who would rejoice at so swift and valuable a remedy.

Mrs. ———, a school teacher in Brooklyn, suffered from a chronic congestion of the vocal cords and muscles so that she was only able to make very hoarse low sounds. For three months she was treated with the routine sprays, etc., of throat specialists, with no improvement. She was fearful lest she soon lose the position on which she depended for the support of herself and sister. In a greatly worried state of mind she came for electrical treatment. The first administration resulted (during the days before she called again) in a gain of fifty per cent in the tone and volume of her voice. She at once lost her worry.

Six treatments restored the full use of her voice. By the relief of the congestion and the restoration of muscular tonicity the function of the cords revived and she was grateful.

The temporary effects of either a slight cold or unusual vocal exertion, or the wear of long-continued singing or public speaking can be so certainly removed and with such satisfactory results, as to surprise and delight patients who are thus treated. The principle is exactly the same as the treatment of congestion or fatigue in any other muscles of the body. But there exists among trainers of the voice, as there does among trainers of athletics, an almost complete dearth of knowledge concerning electro-therapy in this field. If the ignorance was total it would not be so bad, but teachers of vocal music often know just enough of a "faradic battery" to *shoo* at everything else in medical electricity. To them all electricity is "harmful," even if it does not actually "ruin the voice." Could they know the truth they might easily enable their students to profit by it and extend the spread of their renown.

Nor is the author alone in his pleasing experience in this branch of practice. A medical journal contains confirmation from France in the report of a French medical society: "Aside from the numerous physical factors which affect the voice, the integrity of the nervous system is essential to good sound-production. The singer must not only be able to co-ordinate well, but must also have the energy to control the muscular fibres so that he can get and sustain pure notes. Experimental tests were made on persons free from disease and the results obtained were a modification in the volume, the range, and *timbre* of the voice. High notes were easily reached with brilliant effect. The *tonic of electricity aids the study of singing and gives an unusual purity to the voice.*"

At a meeting of the Academy des Sciences, held in Paris, April 5th, 1897, it was announced, as the result of tests, that: "The singing voice, if the vocal organs are sound, becomes clearer, more flexible, with increased volume and agreeability of tone, and is less easily fatigued, after a course of tonic electrical treatment (by selected and approved methods). It is therefore to be recommended to vocal pupils and debutants, as it imparts an exceptional beauty to the voice."

Yet despite the well-ascertained benefits which correct technics can establish in the undeveloped, or overtrained, or strained voice, electricity in this field of immense usefulness at present patterns after the flower of Gray's " Elegy " and " wastes its sweetness on the desert air." So few know it.

In every political campaign one of the features of spell-binding is the hoarseness that overtakes many of the speakers, suddenly overtaxed as most of them are by exposure, broken sleep, excitement, and laryngeal strain. Sprays are a travesty on *real* treatment. They scarcely reach the surface of the speaker's needs. They are a feeble resort. No one who knows any better would again look a patient in the face if he simply "sprayed the throat" of the acute neurasthenic who trusted him to bestow genuine relief.

But such persons *can* be given tonic, sustaining relief that will brace up both body and mind and create new stamina for the entire vocal apparatus. We have demonstrated the facts in many cases, and what may seem a surprising wonder to the patron of routine medicated sprays is the daily *commonplace*—as commonplace as bread and butter—of the resources of skilled electrotherapy.

And when the condition affecting the voice is real disease, still more necessary become the resources of electric currents, for in many of the chronic states of ill-health the voice shares in the debility. In the chronic inflammations of the tissues near the vocal cords—even in tuberculous laryngitis—the only remedy of decisive character is electricity.

# CHAPTER XXI.

## THE LITTLE ILLS OF LIFE.

Showing How Many of Them can be Smoothed Away by the Comforting Resources of Electric Currents.

The pin-pricks of life notoriously make up the annoyances of the average person. A million have *backaches* where one has posterior spinal sclerosis—and the happy difference is that every backache can be removed without a plaster or a drug, while the incurability of spinal sclerosis is almost one hundred per cent.

Therefore, we shall give a little informal attention to some of the minor ailments which do not quite seem so impressive as rare disease and yet for most of which the patient wants a riddance. It will be noted that the physician who does not learn how to prescribe anything but drugs is nearly helpless in the presence of some of these aggravating trifles, while those who add a knowledge of physical remedies to their other medical training can dispose of them as certainly as aconite will reduce the simple fever of a child.

A woman was greatly annoyed by excessive perspiration under her arms. In summer they were "regular tanks," as she stated the case. Powders were useless. Six local treatments with a selected high-potential current resorted the function of the sweat-glands to normal and she had comfort. Some men and women are greatly troubled with sweaty feet. We have known a lawyer who changed his socks three times a day. This "hyperidrosis" is correctible by a little use of electricity. One case, an actor, required but a single treatment. Not every pair of sweaty feet will dry up so easily, but we have seen none that did not become reasonably natural in a short time.

A gentleman had an acute neuralgia of the eyes which he attributed to the cold wind upon his automobile glasses, the cold being reflected back and causing the pain. It took five minutes to remove it, and by changing his eye-protectors to mica he had no further trouble.

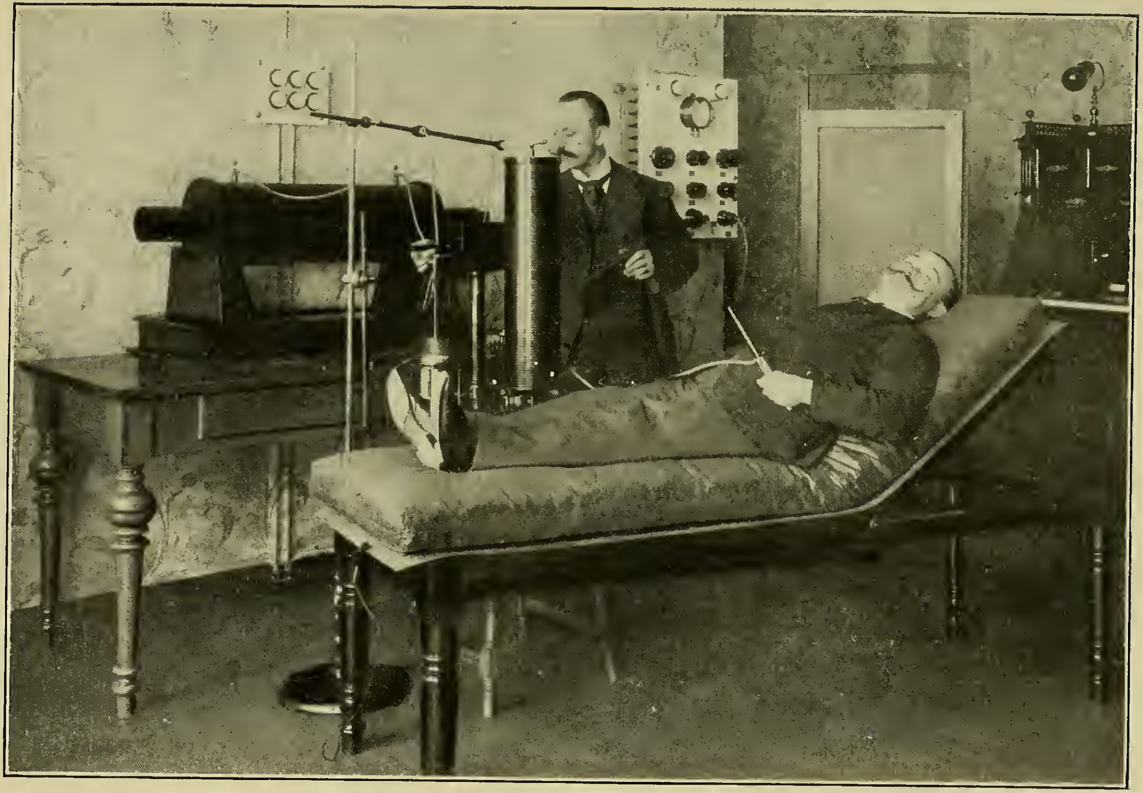
Another automobilist had an acute sunburn on his forehead. It was so tender that he could not bear the touch of his cap. A single cooling application of five minutes removed it entirely so that rubbing the skin caused no soreness. In the same agreeable manner we have removed the superficial irritation of $x$-rays. Any surface tenderness and redness of the skin is removable in this way.

Mr. ——— had a neuralgic pain behind his left ear from cold wind in an auto ride. A brief application of a high-potential current removed it and it did not return. Mrs. ——— had an irritant dust blow in her eye on the way to our office in an open car. The eye was red and painful and the irritation caused a free flow of secretion. She could not open it. A five-minute application entirely removed the distress and restored the eye to normal condition.

A physician called upon us with an acute inflammation in one eye. He was curious to see what electricity could do for it. It allayed it as usual. A young engineer got a cinder in his eye. If cocaine is used to ease the pain so the cinder can be removed it disturbs the tissues and nerves, and the eye is not again normal for a day. By the quick aid of electricity we quieted the irritation so that he could keep the eye open while we removed the particle of dust. Then the same current took away the congestion and put the eye in a physiological state again. There is nothing in these cases to compare with selected actions of high-potential currents. Swift and delightful and efficient, they seem like very masterful weapons to the clinician who knows their worth and their technics.

Paralysis of the external muscles of the eye must look to electricity for its cure. Twitching of the muscles of the eyelids is generally relieved by a few treatments, or may be the result of irritants in the circulation and require general elimination.

Failing eyesight from debility, anæmia, tobacco habit, or excessive taxing of the eyes is amenable to very great improvement by both strengthening the nerves, vessels, and muscles of the organs of sight and building up the general condition. The manifold tonic and nutritional resources of electricity are a blessing to postpone the effects of age upon the eyes. Eye-strain is the popular fad of oculists to-day who accuse it of causing a score of things besides headache. Sedative-tonic treatment by selected electrical methods will remove the effects of the strain at once and abate



THE AUTO-CONDENSATION HIGH-FREQUENCY METHOD

The patient reclines upon a couch. Under the mattress is a sheet of metal. This is connected to one pole of the resonator and is also grounded. The opposite pole is connected with the patient. No sensation is felt during treatment. This method is the nearest approach of the coil to simulate the static method of platform insulation and charge.

all the evils of it. Then, with correctly fitted new glasses there will be no trouble.

Partial deafness from extension of catarrhal inflammation is usually improved by very simple external means with the high-potential currents, and those who make a specialty of diseases of the ear can employ local technics which often produce a cure of the entire condition. Noises in the ear are more likely to be abated by electrical treatment than by any other remedy.

An aching bunion can easily be eased and comforted by a simple electrical spray. So can an aching corn. So can an aching tooth, and so can an aching muscle or nerve almost anywhere in the body. It is done every day. We once were able to retain the services of an excellent cook for three years because of her dependence on the comforts of electricity. She had corns, a bunion, carious teeth and headaches. On the recurrence of any pain she would appear and gently request "a little static." It never failed her and she only left to get married.

Some who are descended from doubting Thomas and have no "faith" in electricity might consult that cook. It ought to be widely known ere now that electric energies at work care as little about anybody's *faith* as Niagara cares for a plank tossed in the gorge. The current pays no heed to the plank, nor is conscious of it. Some individuals feel a sense of superior wisdom in asserting that they no not "believe in electricity." There are coolies in the desert of Gobi who do not "believe" in a railroad or a telephone.

To some persons a fine complexion is a matter of business or professional importance: to others a bad condition of the skin of the face, eruptions, dark rings under the eyes, etc., may be a mortification. In either case it is nearly always feasible to satisfy the wants of the individual by means of the varied resources of electrically operated apparatus.

But the reader should have an intelligent idea of what is required. It is not a mere matter of rubbing an electrode over the face, or applying a vibratory massage, or local treatment of any kind whatever. The foundation of *complexion* is the general health.

When some space writer is assigned to fill a column in a Sunday supplement about the time of the arrival of a distinguished French actress we are apt to be told all about her "beauty doctor." Sometimes the space writer tells what fruits to eat for the complexion: and probably the abuse of the fruit habit is not surpassed by any one cause of bad complexions. But there is no cosmetic equal to the normal action of the organs of the body, and when functions are deranged the remedy is not a local matter for facial massage only. In eliminating the materials of auto-intoxications from the glands, tissues, and fluids of the body we have an efficient resource in the energies of electric-light radiations and other technics of electricity. The bloom of health is the only true and satisfying complexion.

*Obesity*—an excess of fat—is another cause of discomfort to some who would like to weigh less. For that corpulency which is the "oily dropsy" of Byron and is acquired in later life a great deal can be done to improve the condition. But for the inherited type seen in young girls and boys a reform in the balance of nutrition is a more difficult matter.

Many of the laity suppose that overeating of sugars and starches (potatoes are about seventy per cent starch) is to blame for obesity, but modern investigation tends to place the blame, not on either sweets or fat foods, but on the less readily oxidized albuminous elements of the diet—together with deficient exercise, and the drinking of alcoholic beverages, particularly beer. The long-accused sugars and cereals—the "carbohydrates"—are converted into water and carbon dioxide and *not* into fat as most of the public imagines.

Medical wisdom, as expounded in the semi-starvation treatments of obesity, has seldom been wider of the mark. What the over-fat individual needs is an attempt earnestly made to restore the normal balance of nutrition so that the distribution of food to each set of tissues in the body will conform to nature's intentions—not a diet that will unbalance the metabolism still more. Correct such abuses as excessive beer-drinking, or excesses in any habits. Put the patient on a sensible mixed and healthy diet and then *make* his tissues distribute the nutrition properly. This can usually be done by the resources of "physiologic therapeutics." There is no other way so safe and so successful.

A distinguished European specialist in the bath and gymnastic management of dieted obesity has stated: "Obese persons have every reason to be thankful if we succeed in *diminishing their increase in volume*." And those who have abated their avoirdupois by rigid self-denial at the table, or have worked off a few pounds by sweating exercises, find that such methods are temporary and mistaken *unless rational physical therapy is added to them.* But the wise physician does not attempt to cut down the weight of such a person to their weight of early life, for in the majority of cases the annoyances of fat are not measured solely by the scales. A fatty and weak heart will not be strengthened and the infiltration removed by a loss of ten, or twenty, or fifty pounds in the body weight. The application of other principles of nutrition must do for the patient what *reduction* alone cannot do.

Dependence upon "reducing systems" for the control of obesity is not only burdensome to the patient but is apt to be harmful. The right method of genuine physiological treatment employs three or more of the nutritional, function-regulating resources of electrical energies; one of which aims at altering the metabolic balance in the tissues, another, at the increased combustion of fat in the soft parts of the body where it is the greatest inconvenience, and still another, at making the patient more mobile, more enduring and energetic, ridding him or her of troublesome palpitations of the heart, of shortness of breath, of flatulent distention and the attending debilities of this state. As a rule we obtain the most satisfactory results in these cases—results more immediate and lasting than are possible by any methods which omit the modern methods of physical therapeutics.

Many women who are uterine invalids are mortified by a too obtrusive "stomach." This tendency to bloat below the belt (when not a deposit of fat) has been remarkably corrected in some cases during electrical treatment of the uterine condition. Sometimes the alteration has been strikingly apparent as soon as the patient arose from the table. For instance, Mrs. L——— was quite bloated on arrival for treatment, her dress drawing in wrinkles over the sides and taut across the protruding abdomen. Immediately after treatment she was noticeably improved in shape. Her dress hung better, and her satisfaction in the lowering of the abdomen was almost as great as her relief from the pain and heaviness from the pelvic organs.

Mrs. ——— was another example of this type of improvement often seen in the treatment of chronic uterine derangements. She had been ill for five years and had a very prominent abdomen. After several treatments of the pelvic condition she spoke for the first time of her embarrassment with her stomach, and remarked that it was getting smaller. After two months' regular uterine treatment the improvement in her abdomen was as great a pleasure as the gain in general health. Two years later she was seen again and her waist, stomach, and general shape remained normal.

Backache is the bane of women. Not "lumbago," but simple *backache.* With it is often what is called in medicine an "irritable spine." The two make an annoying combination. Mrs. ——— had such a combination. She also had other infirmities that brought her to the comforting resources of electricity. To make her first visit she painfully took off a porous plaster and reported that for three years she had tried to get relief. Her excellent and much-beloved physician had tried many drugs, sometimes resorting to morphine in her worst attacks. When he was at his wits' end he would say: "Why don't you try another plaster?" But the pain irritated her nerves and upset her seriously. These cases are baffling indeed to pure medicine, for what disease can a drug be fitted to? There is no disease—only the backache.

But for electrical energies to soothe, warm, and iron out the wrinkles of the aching tissues is play, so easily is it done. The first treatment of Mrs. ——— removed the spinal irritation and pains. Some of the ache came back the next day, as is usual in a severe case. The second treatment took away the pain and less of it came back. The third treatment finished the back and since then it has been entirely comfortable. As she had other chronic conditions requiring longer treatment she is still under observation, so that our information about the relief of her backache is up to date.

But it must be remembered that all pains in the back are not of this type and in true lumbago, for instance, when the myalgia is grafted upon a rheumatic diathesis it is apt to be hard to dislodge. Still, patience and proper treatment will produce satisfactory results in most cases unless a central degeneration is behind the pain.

*Pruritus* is the medical name for an itching of the skin which is not the itch of eczema, scabies, or any other disease—just pure *itching.* When this annoyance attacks the scrotum, anus, or vulva, it is a veritable invention of the devil for making life a burden. And it is *almost* impossible to find a curative drug for this infirmity. A few prescriptions give temporary relief, but the trouble may last for years. It sometimes has no sign of cause visible and is then called a "neurosis," but it may depend on altered nutrition and perverted secretions, in which case it is more certain of cure. It has been said that "one half the world does not know how the other half scratches," so prevalent is this itching on some part of the body at some time during life.

A varied experience with a number of cases during the past fifteen years has convinced us that the greatest amount of comfort—the nearest approach to a definite cure—is likely to result from electrical treatment. Some cases have been so modified as to be no longer a drain upon the nervous system. The moments of uncontrollable frenzy and unavailing scratching have been replaced by a milder condition that was tolerable indeed to one who had known the extreme of torment for a dozen years. There are three great resources in electric currents for this affection and with them we have far surpassed the effects of drugs and sometimes the itching has ceased entirely.

Lame feet, possibly from imperfectly fitting shoes but often just *lame feet*, affect the comfort of an army of people. A long day of activity is doubly tiresome; sometimes it is actual torture. The palliative comfort of a hot soak and change of shoes is a temporizing reliance and exerts no permanent influence on the tendency to fatigue. But scarcely anything in medical experience is more certain than the long relief afforded by electricity. It comforts and sustains the jaded feet as it does a weary heart and tired brain, beyond comparison with any other remedy. The following is an extreme example:

Mr. ———, aged 55, salesman, on feet a long day, had an acute attack of sciatica. Also had varicose veins and had worn a supporting elastic stocking much of the time for fifteen years. The first treatment removed the sciatic pain and the rubber stocking and he has never wanted the latter again. On his return for second treatment the sciatic pain was less severe and was again removed. When through this treatment he remarked that if he only had good feet he would be happy, for it hurt him so to walk that he could not take exercise or walk for pleasure or even keep at work, the aching being so severe that he changed his shoes three times a day. Two blocks of walking made him limp.

His feet showed the effects of tight shoes long ago—they had hurt him for twenty-five years, he said—and the ball of each foot was occupied by a dense callus like a diffuse corn. The sole was tender to pressure and a corn on one toe was painful. A soothing high-frequency current ended the entire condition so that on replacing his shoes he remarked that he could now "walk on cobbles." This relief was given him before any attempt to trim the callosities was made.

Later he had them trimmed and six treatments finally restored a security and comfort to the feet such as he had not known for a quarter of a century. No medical prescription can do these things with aching feet, but electrical resources do them easily in all cases not requiring some orthopedic support.

His surprise at relief in his feet then led him to disclose the fact that he had rheumatism in his shoulder, and was also subject to occasional headaches. Treatment directed to the rheumatic condition gave him the relief desired and thus, by the aid of rational electrical measures (thirteen treatments extending through five weeks and a half) he was put into a condition of general health which should not soon again relapse if he uses ordinary care. Many persons turn their ankle easily while walking, or wrench the small muscles of a foot, or suffer a long-lingering distress after a bad-fitting shoe has been discarded, and all these cases yield readily to proper actions of electricity.

In the immediate relief of bruises and contusions electricity surpasses all other resources of the physician. Mrs. S——— fell on the pavement. The "black-and-blue" swelling on the side of her thigh was about the size of an inverted saucer and very sore. It happened the previous day. The soreness was entirely removed by treatment, and absorption of the blood stasis went on rapidly without any further application. The one treatment proved sufficient.

Mrs. G——— slipped in getting off a street car and bruised her shin against the iron step. On reaching our office it was very painful. The usual sedative application gave immediate relief and no further attention was necessary.

Mrs. ——— was kicked in the breast by a vigorous baby. The deep soreness and lump that resulted were entirely removed by one treatment and no ill consequences ensued. A nursing breast does not take kindly to a blow.

The following case illustrates the action of electricity in combating the blood stasis of an acute bruise and re-establishing the circulation in the injured tissues. At two o'clock P.M. on October 7th, 1905, a workman was on the point of leaving his shop when he struck the back of his right hand violently against a machine shaft. The severity of the blow "almost caused him to fall and he could scarcely refrain from crying out, the pain was so great." The arm became numb and paralyzed. When he arrived at our office (where he was due to set up a new apparatus) he had a marked swelling on the back of the hand, very intense pain and loss of motor function in both hand and arm and a sense of heaviness. A rapid counter-irritant application of high-potential current led him to remark in thirty seconds, "It is astonishing how light that makes my arm feel." A sedative application next removed the pain from the contusion on the hand. The ring finger still felt numb and a special technic gave back the normal sensation.

He could now work all fingers and use the arm comfortably, but forcible bending backward of the hand could still set up a remnant of pain and this was removed by a different method. He then worked with screwdriver, pliers, and other tools and set up the apparatus as well as if he had not been hurt and went home stating that his arm was all right. Four days later he called again and stated that hand and arm had given no further trouble of any kind, the relief from treatment having been complete and permanent. This illustrates the advantage of immediate attention to contusions, for after some delay they take longer to overcome.

An exceedingly satisfactory case was the following: Mrs. ——— stooped suddenly in a dark closet to pick up something on the floor and struck the centre of her forehead with great violence on the metallic corner of a trunk that stood on end out of sight. The pain was intense and a welt about two inches long and three-fourths inch wide rapidly puffed up from the surface. She tried at once to ease the pain with a hot application, but could not endure the slightest contact with the agonized tissues.

In all the resources of surgery and medicine there is but one thing that can do this work without touching the painful part, and this great resource is the static spray—in expert hands one of the most beautiful instruments among healing agencies. Within ten minutes after the accident occurred this remedy was applied and relief began at once to ease the splitting headache, reduce the soreness and swelling and prevent discoloration by venous stasis. At the end of fifteen minutes' work the swelling was one-half smaller, the headache and pain were gone for the time being, and the appearance of "black-and-blue discoloration was prevented. Some of the soreness soon returned but in a mild degree.

Treatment was repeated next day. Swelling was now down almost to level of surface, soreness across forehead was much less and the site of the bruise was only a little tender to pressure after this second application was made. On the following day two more applications completed the recovery of comfort to normal. Without immediate treatment this would have been a tedious contusion, and the severity of the blow was evident later from a depression in the bone where the corner of the trunk struck. It was a narrow escape from fracture of the outer table of the skull, and the quick relief of pain and swelling accomplished without touching the tissues shows the value of this method in contusions.

In older cases which have been neglected or treated by other means the discoloration is not immediately removed, but the remaining soreness can be disposed of promptly unless some deeper injury lies behind it. Such a case is that of a school girl, now thirteen years old. Three years ago she was struck on the anterior ridge of the pelvic bone while at play. Since then she has at various times complained of tenderness on pressure, as when she lay on that side at night. Examination revealed no evident lesion and the pain was attributed to the lingering bruise of the blow. It did not, however, remain away when removed by two treatments and the recurrence pointed to an injury to the nerve more difficult to correct than a bruise. Six treatments gave her entire relief.

*Sprains* of all degrees are another field in which the efficacy of electrical resources make routine surgical methods seem out of date. A young Miss fell on a stair and sprained her ankle. She could barely hobble. The first treatment enabled her to walk with very little stiffness or pain. The second treatment almost restored the ankle to normal and the third did so. She had no further trouble.

A physician sprained his wrist at golf eight months previously. He had given it his own routine treatment and a medical friend had "tried electricity," but the wrist was still painful and difficult to use. Six proper electrical applications restored the joint to normal, relief being marked from the first. The result opened his professional eyes to the difference between correct technics and the ignorant abuse of a great agent.

A boxer sprained his thumb eight months previously by miscalculating a friendly "left hook" in a bout. He had also sought a number of kinds of treatment, including electricity, and without relief. The hand was useless for his business. It began to improve from our first treatment and in eight applications was as useful as ever.

After fractures and dislocations the use of electric stimuli to restore the contracting elasticity of muscle fibres is one of the necessary things in surgery. Mr. ——— was thrown over an embankment and suffered a compound fracture of the patella. When he was released from the confinement of bed and extension splints the muscles below the knee were greatly wasted and the knee itself was ankylosed—immovably stiff. For the ankylosis, if due to bone adhesions, there is no remedy, but if simply the result of immobilization of the soft parts we have the best of remedies in selected actions of electrical currents. The knee was treated for several months, but in this case proved to be almost as obstinate as if the bones had grown together. The leg muscles took on bulk again and he walked as enduringly as ever but with a stiff leg. Treatment was stopped at the end of six months with the expectation that benefit would develop gradually until the limb was restored to almost a normal condition. This hope was justified by the result, for in about a year afterward he walked with scarcely any noticeable limp at all. In a great variety of conditions the benefit of electrical treatment goes on increasing for a considerable period of time.

An interesting fracture case (one in which the surgeon was helpless) was the following: Miss C———, aged about 55, was unable to use her right hand for any purposes requiring ordinary control and strength. Some years before, she had fallen on the stairs and broken the middle metacarpal bone. It failed to unite and this not only weakened the hand but prevented fine uses of the muscles. These were wasted and possessed little power. Formerly she had been a superior needle-woman and prided herself upon embroidery, etc.

With us she had eleven treatments in all. Nothing could reunite the old fracture, but we removed the pain, tendency to spasm, and debility. The nutrition of the muscle fibres was restored. The wasted muscles took on some increased bulk and strength. Distance and circumstance prevented her from continuing treatment longer. We heard nothing of her for five years, when her sister met us and reported that the hand gained steadily and within a year she had been able to sew as well as ever and to use the muscles with very great satisfaction. This result was due solely to building up the muscles around the small bones, which, by their increased tonicity, they then held in place.

Another interesting performance of electricity in a case beyond either surgery or medicine was the following: Miss ———, aged 18, had nasal catarrh and a chronic localized bronchitis. She was pale and anæmic. When she took a deep breath through her nose the right *ala nasi* collapsed against the septum so that little or no air got through that side. While treating the chronic inflammation of the mucous membrane we also made tonic contractions of the muscular tissues of the side of the nose and in a month developed sufficient tonicity to enable her to take a full breath without collapsing of the nasal wall. This was an important gain for her and it can readily be seen that no other means could have accomplished it.

Of interest also is the following case of nasal obstruction to normal breathing: Mrs. ——— was a young married woman, somewhat anæmic and nervous, part of which was attributed by her physician to deficient oxygenation of the blood. She had small adenoids and two very small nasal polypi; and, in addition, hypertrophied turbinates. The physician was ambitious to perform three operations to clear the nasal passage for free ingress of air. She finally decided to wait a little and see if the operations were unavoidable. So the doctor let the adenoids go, touched the polypi with a caustic, and with some scorn of her determination to have the turbinates treated with electricity, dismissed her.

Inspection showed the right middle turbinate swollen out like a round ball and touching the septum and closing the passage. She could not breathe through this side of the nose. Immediately after the treatment (which was essentially an electrically generated spray of healing ozone) inspection showed a clear space between the septum and the swollen tissues and a reduction of about one-fourth in the size of the enlargement. She could breathe freely on both sides of the nose. Her physician had taken her to a "specialist" in nasal diseases to support his contention that nothing would do any good but cutting out the turbinates. After four healing treatments with the selected spray method—as agreeable to inhale as an ocean breeze in summer—she had entire relief and during the past winter has needed no further treatment.

Work of this kind upon the nose can be done to advantage, although far less brilliant in the eyes of the surgeon than an operation, but we believe it to be to the interest of every patient to save the turbinate tissues *always*. Once lost they can never be replaced and they are of immense importance in warming and moistening the air we breathe. To cut them out simply because they are enlarged is trivial incompetence—not scientific medicine. Treatment to restore as nearly as possible the normal, sound state is what the patient needs and electricity helps to do this. It may be said that the spongy tissues of the nose may congest again and cause an interference with free respiration, but the same liability exists in every nose exposed to a raw atmosphere. If this occurs it is better to repeat the healing treatment than to cut out tissues that the nose needs.

Some persons of the strictest temperance have a redder nose than they desire. If this is simply a suffusion of the capillaries it can often be improved by tonic applications of a current directed to contracting down the elastic fibres of the vessels.

Mr. ——— was operated on for appendicitis a year previously. The scar became the seat of pain. His surgeon tried various means of relief without success. The suffering at times interfered with his business. The first administration of a sedative-tonic current removed the pain. A little of it returned next day. A second treatment removed the remnant, and the suffering of a year was disposed of in this case in two days. Neuralgic pains not seldom appear at the site of an operation and the necessary measure of permanent relief is electricity. Yet sometimes the scar tissue seems to have caught a filament of nerve in such a way as to resist a great deal of treatment. One of our cases of sciatica had a scar three inches long on the back of his thigh in the course of the nerve, the result of cutting down to the trunk and stretching it. By several electrical methods we were able to ease the pain and keep it away for a time, but to finally make a permanent cure proved to be impossible with the apparatus we had twelve years ago. To-day we should expect to succeed better with such a case.

Sometimes patients are advised to wear a truss support over the scar of an appendicitis operation, but a very small amount of electro-tonic action upon the muscle fibres will serve them better.

Weakened muscles always call for the strengthening energies of electric currents.

Sometimes a scar contracts with adhesions in the muscle masses which prevent free use of them. Mr. ——— had a deep cut extending diagonally across the middle of his right forearm. The accident occurred several years before, but he could not half close the hand, and the use of the arm was considerably impaired. By electrolytic softening of the hard scar tissue and loosening of the adhesions we succeeded in enabling him to use the hand and arm with about eighty-five per cent of normal freedom. When an arm is fixed in a flexed position in order to heal a fracture it may remain stiff and unyielding for a long time after the splints are removed. Fibrous ankylosis is not an uncommon result. The condition can be greatly improved by selected electrical methods of acting on the muscles and joint to restore mobility.

Mr. ———, aged 19, was vaccinated on his leg. A lymphatic gland in his groin became infected and inflamed. When he appeared for treatment he could scarcely walk, pain was intense, and the swelling was nearly the area of a half orange. This situation is inconvenient to bandage, and a bandage is inconvenient to the man who must attend to business. Rest in bed was out of the question for this young man. He would lose his position if he lost a day. Electricity came to his rescue. The first vaso-constrictor sedative application of a high-potential current removed the pain and reduced the size of the gland fifty per cent. The next afternoon a second application again removed the fraction of pain that returned, and still further contracted down the tissues and reduced the size. No further treatment was given and in a week resolution had gone on to a finish and he had no further trouble. Almost any acute swelling of a gland is amenable to this method. Even in the treatment of carbuncles and boils electricity is of the very greatest assistance, easing the pain, hastening the processes of repair and finishing the healing.

What were formerly called *scrofulous glands* are especially in need of electricity, as well as internal medicine and upbuilding. A family were in the country for the summer and the baby, then two years old, developed an enlarged gland in the neck. The local physician assured them solemnly that it should be cut out. The father had been more familiar with the resources of medical electricity than the physician was and he took a train for New York with the child. She had two treatments and action enough to start absorption, and went back to the country to finish her vacation. The gland has needed no further treatment and she is now eight years old.

For medical teachings to perpetuate ignorance may strike the laity as not in keeping with a progressive science, but while here and there the leaders in research and progress are making known new things and new advances upon older methods, the great slow-plodding mass of the profession moves on in the rut of almost unvarying decades, impervious to good things that are a little trouble to investigate and grasp. Many love to call this attitude, "conservatism," thereby intimating that it differs from sheer stupidity, prejudice, lack of enterprise, or disregard of the real welfare of patients—but the results to patients are about the same. The following is an example:

A young woman was presented to a clinical class by a specialist in the department of nose and throat. She had also an enlarged cervical gland and the condition which was once known as "strumous." The instructor turned to the class of physicians who were assembled for the purpose of *learning*, and pointing to the enlarged gland said: "Gentlemen, of course, there is but one thing to do for this—cut it out." But for more than a generation electricity has been demonstrating that a method which acts on the nutrition of the tissues and reabsorbs the vascular engorgement without cutting and without a scar is superior in every way to the crude treatment of the knife.

A related case was that of Mrs. C——— who had a deep suppurating sinus in the neck which had not healed under ordinary treatment. The end of a lead pencil could have been sunk into the hole for more than an inch. With a selected electrode to reach the inner walls of the sinus a healing current acted on the lining membrane which maintained the ulceration, and healing by granulation was stimulated from the bottom up, so that within a week and with simple dressings it progressed to a finish.

*Ulcers of the leg* affect many elderly people because of lessening of nutrition in the anterior region of the tibia. Some of these are the result of varicose veins. Sometimes an area will become dark and lose its vitality without ulcerating for a long period. The proper feeding of these tissues by means of an ample blood current sweeping through the arteries is the indicated treatment. Nothing in medicine will reach the needs of the case with thorough and lasting efficiency. Electrical stimulation of nutrition *will.* Passing many minor cases in our experience we cite an illustration of unusual interest to those who have even the least of predisposing conditions.

Mr. ——— presented himself with a long, wide and deep ulceration of the leg, extending from the upper third of the tibia to near the ankle. He wore a wire frame over it to protect himself from injury in a crowd. He had made three attempts to heal it by surgical operations during twenty-five years, two of them by Dr. Willard Parker, then one of the very competent men in the profession. By means of the antiseptic action of an electrical discharge—a soothing ozone-bearing brush—the offensive odor of suppuration was removed, the local tenderness lessened, and healing was begun. After three treatments he never wore the iron mask on the leg again.

By selected technics the blood was urged through the indurated environment and the ulcerating tissues were fed fresh blood from the arteries. Elimination was aided and muscles all over the body, lax from lack of exercise, were made to contract and take on healthier vigor. The ulcer improved and the leg was no longer a running sore. Electricity did not take this case to a finish alone, for beyond this point it required attention to the necrosis of the bone by surgical methods, but the net credit of electricity to the patient was this: it produced in two months entire relief from pains, debility, and the symptomatic disturbances of chronic septic absorption and healed down the soft parts to the area of necrosis, at the same time giving the man a better state of general health than he had known in many years. His appetite, sleep, digestion and functions were all improved, and he regarded these things as worth while. He was then fitted to benefit by a finishing operation.

Very closely associated with the genital organs in both sexes is the rectum and a few conditions here need rectifying at the same time.

Rectal ulcers and fissures are successfully treated by healing electrical applications, both mild negative electrolysis and High-Frequency currents sufficing. Rectal strictures have been treated by the same means.

Hemorrhoids—piles—are treated according to their situation, character, and severity. If all cases had the benefit of early electrical treatment there would not be any of the astonishing disfigurements of the rectum now seen on the surgeon's operating table, most of which result from years of neglect.

A "thrombotic" pile needs to be incised and the clot turned out. For the old bullet-like tumors sometimes found after previous injection treatment electricity furnishes negative electrolysis. For advanced and operative cases the same agent supplies the surgeon with the much used electro-cautery.

But for practically all other cases, and especially for what is called "an acute attack," the quickest relief and comfort, and the most permanently curative results require the ordinary resources of electro-therapy. The mechanical dilators and applications of heat and cold cannot compare with the far deeper actions of electric currents. And with special electrodes, the high-tension coil, the High-Frequency, and the Static currents are all useful. The soothing influence of light rays on a protruding and tender tumor is like nothing else in medicine.

In the recent and mild state marked by irritation and spasmodic contraction of the sphincter ani—a common cause of constipation—the first five minutes of a selected electrical application removes the spasm, allays all pain and tenderness, relaxes the anus, and restores the comfortable state. We have obtained these results many times when patients felt so sore that they could not sit down and could scarcely bear touching, but the moment the sedative and soothing current begins to act the pain begins to abate. With regulation of the liver and one, or perhaps two or three local treatments these cases go on without trouble for an indefinite time, and when their next "attack" arrives the same measures will again correct it.

If there is a chronic hemorrhoid or a group of piles a few electrical treatments will not shrink them down to normal veins—and piles are but little pockets (dilatations) in the walls of the plexus of veins that supply the rectum—but immediate relief will result and sufficiently persistent treatment will secure a very long lasting improvement entirely satisfactory to the majority of patients. The mental relief from the annoyance is unspeakable.

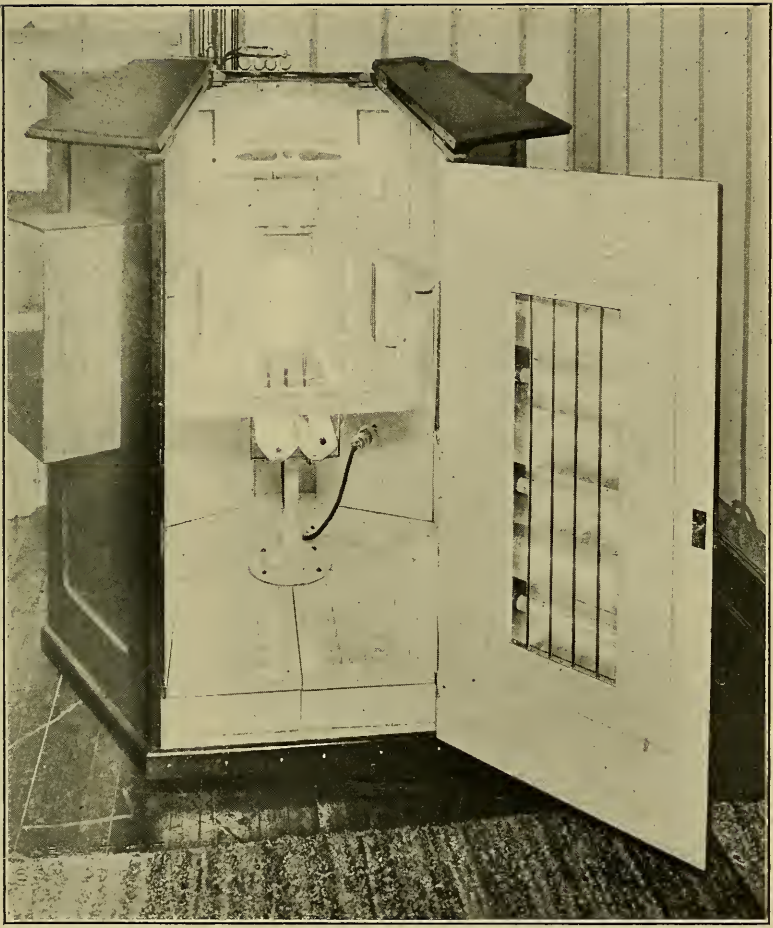
In the use of medical methods with the high potential currents there is practically no sensation to the patient—that is, the current is scarcely felt. It not only does not "hurt" but the patient will have the internal "hurt" of the tissues taken away by the soothing current. Short of a radical cure (and there is no radical cure that is perfect and without drawbacks) the medical applications of electricity give the best results to the greatest number of persons. It is far more than a palliative and in many cases is almost a "cure." In all congestions of the rectal tissues the vaso-constrictor application of a fine, rapidly interrupted, induction current is effective. Nothing equals it.

In deficient muscular tonicity of the parts, the result perhaps of long use of suppositories or enemas to move the bowels, the restorative agent is necessarily electricity, for no other means will contract muscle fibres and energize them into renewed strength. Electricity will.

Another rectal infirmity, frequent in young children and occurring occasionally at all ages, is "Prolapsus Ani," sometimes called "falling of the bowel" by mothers of children so afflicted. All but the worst of neglected cases can be repaired by the muscle-toning action of selected currents. We have relieved mild cases in from one to two weeks, and some of the simplest cases have had no further prolapse after the first application. It is a remarkably satisfactory procedure when we consider the useless puttering with other measures.

After cautery or cutting operations about the rectum the surgeon leaves the repair of the tissues—as he always does—to nature. In some cases adhesive exudations will occur, preventing free contraction of the sphincter ani and causing distressing symptoms, sometimes pain from the pinching of nerve filaments in scar tissue. By the aid of electric currents and selected technics these adhesions are easily broken up, absorbed, and the irritation removed. The capacity of electrical measures to restore comfort to the rectum is far greater than is possessed by any other single remedy.

During pregnancy, and especially during the period of heaviest pressure upon the internal organs, it is difficult to over-state the relief given to patients by the technics of skilled electro-therapy. Not only has High-Frequency application unfailingly removed the tightness and unrest of the sphincter and taken away the pain of hemorrhoidal congestion, but time and again the patient has been eased of reflex disturbances, quieted in her nervous system, and toned up in every way—for this local treatment is accompanied



COMBINED ARC AND INCANDESCENT LIGHT CABINET AS IMPROVED BY THE AUTHOR

For medical uses two models of cabinet are necessary, for it is mechanically impossible to place in a single enclosing case the essentially different conditions of treatment that are required by patients at the two extremes of pathological indications. This cabinet and the rectangular model are the two designed by the author as improvements upon any previous models. This form is an efficient adjunct in the treatment of lumbago, affections of the kidney, and rheumatic and gouty conditions.

by the general tonic electrification of the entire body and its benefits are not limited to the rectum.

In vaginal applications the same thing is true. And it may be useful to state here that nothing else known to medical science will do so much to take a woman with comfort through the difficulties of gestation—from the first nausea to the delivery of the child—as will the safe resources of function-regulating electricity *with skill behind it.*

A curious instance of vaso-motor vagaries associated with a really serious condition shows how electrical resources can straighten out the unhappy system of a man who, for fifteen years, had almost turned himself into a walking drug shop—a physician who found no lasting benefit in any internal medication.

This patient had an irregular, weak, nervous heart with commencing arterio-sclerosis, and the cardiac depression brought him for treatment—for, while heart stimulants and tonics have their place in temporary derangements, the only safe, and substantial resources in chronic conditions are to be found in physiologic therapeutics. These are the only means by which we can aid nature to regulate and sustain the heart without reaction.

Among the incidental things which made the business of this man irksome we gradually ascertained and treated the following: He had irritable eyelids, subject to spasmodic twitching. Often the conjunctiva was irritable also. He had ringing and impaired hearing in both ears. Many years ago he had a suppurative ethmoiditis which discharged through the nasal cavity. There had been a necrosis of bone. Six years ago this was operated on and the condition improved, but evidently a pocket of pus was left and some obstinate discharge continued through the nose. In the region over this area he felt a constant soreness.

In both sides of the nose there was a chronic catarrhal inflammation, with enlarged turbinates. He was having a nerve killed in one of his teeth and although the dentist had filled the tooth yet it was sensitive to cold and remained in an irritable state. His digestion was very much impaired and he restricted himself to a very careful diet. His feet were habitually cold, so that in winter he wore from two to five pairs of stockings to keep them warm, having extra large shoes made for the purpose. His bodily heat was so deficient that he was obliged to wear flannel underclothing beneath his night gown, and for fifteen years he had not slept without a night cap except in summer. One shoulder was rheumatic. And there were other things which we will pass.

Imagine an attempt to write a medical prescription to fit this case. He had his favorite palliatives for some of the most troublesome features and for acute attacks of different invasions, coryzas, etc., to which he was subject, but a curative remedy he lacked.

From the many-arrowed quiver of electricity we drew, one after the other, the shafts that sent these various vagaries, neuroses, and what-nots, to their long home. Those that were not wholly removed were greatly improved—these being the ringing in the ears and the state of the digestive organs mainly. He had been unable to fix his mind on business details or remember figures, but he soon recovered more active faculties, as well as a greatly improved ability to walk. He wore no more underclothes or night cap in bed. The healing current did for the nose what several nose and throat specialists had failed to do with routine methods. One application removed the sensitiveness of the teeth. He felt "like an altogether different person." But the doing of these things with electrical energies presumes the adequate knowledge of technics and the possession of many resources of apparatus and experience. A faradic battery in the hands of a layman will not do work of this kind—nor would it in the hands of Edison, Faraday, Morse, or Machiavelli. The tools used were an electric-light cabinet bath, a Nauheim bath, the High-Frequency apparatus and a Static machine of exceptional energy.

And, speaking of teeth, reminds us of the great comfort rendered by electric currents in some of the trials of the individual with the dentist. Mr. ——— had his front teeth pulled out for the purpose of getting better ones. The day it was done was raw. The dentist sent him home with no precautions against taking cold in the oozing and sore gums. They were *very* sore. He was sore himself. But with the gentle soothing of a summer breeze upon a heated brow, and in ten minutes' time, the tenderness was taken away by an electric current. He could sleep and eat and compose himself to quiet, for his teeth no longer hurt him.

And here we will recount a case of the slow but undermining *pyorrhœa alveolaris*, known to dental literature as "Rigg's disease." It is an ulcerative erosion of the gums with late absorption of the alveolar processes of the bone and loosening of the teeth—an exceedingly annoying pest in its finality; overlooked by all in its beginnings. In theory it is curable, but in practice patients are very seldom cured by classical methods.

Mrs. S——— called April 2d, with a severe odontalgia. Had taken "cold" in her receded and irritable gums of the lower front teeth three days ago. Suffered severe pain; awake all night; slightest touch hurt; pressure on chin intolerable; eating impossible.

For several years, on the annual repairs of her teeth, her dentist had said that the cleaning then given was about the last, there being an advanced pyorrhœa. She now came in tears with her suffering because he had told her she must have the teeth out. In her neurasthenic condition the news was a shock.

In a brief administration of a sedative current, carrying balm and healing to the tender tissues, we removed the entire pain. When it returned it was much less severe. April 3d, she called again. The gums were paler and had lost the red and angry appearance of the day before. Gave further relief by repeating treatment. April 4th, she reported, "had great relief in whole head from last application. Slept well and can now press chin without soreness. Repeated same treatment." April 7th, reported, "gums free from pain and tenderness; can now brush them with comfort; have been again to dentist and he now thinks he can save them."

April 10th, reported, "gums doing well; can eat peanuts; have not been so well in a long time." This was the fifth treatment so far. On April 18th, she received her tenth treatment and said she had suffered no pain in two weeks. On May 10th, she had her fifteenth electrical treatment and came direct from a visit to her dentist for examination. The dentist cleaned away the tartar with little bleeding during the process. Found the gums "looking healthy and a good color; teeth firmer than before the electrical treatment; think they will grow still firmer."

She then removed to Chicago and remained one or two years, and was not treated again with electricity. Some three years afterward she had the teeth drawn on the advice of a dentist and was fitted with a new set. An infective process like this cannot be "cured for life" by a single and brief period of treatment, but with the co-operation of the patient, the dentist, and electricity and reasonable care it will generally be possible to hold the process in practical arrest and preserve the teeth from premature extraction.

Just here we will refer to a case of cancer of the tongue in which a safe and agreeable use of a high-potential current was able to relieve the man of suffering and prolong his life beyond any surgical method we have seen. An operation for removal of the tongue and half the jaw with its infected glands is so radical, and so seriously disturbs the functions of eating and speaking, that only positive benefits can justify it. We have recently seen it stated in a collection of surgical statistics that the average prolongation of life by an operation for cancer of the tongue was only three months greater than when no treatment at all was given.

This would not much more than take the patient through the operation and recovery from its effects. He would not be able to talk nor eat naturally, and has no guarantee that he will be free from pain. This is a bad showing, and hopeless as the alternative is, no one should advise an operation who is aware of what electricity has done. And before we go further let us say to prevent mistakes that galvanic electrolytic action is not suited to cancer. Many have tested its action and found that it was not only not curative but led to a stimulus of the growth. A different method, using mercury-coated electrodes, has been applied to other situations, but not, so far as we know, to cancer of the tongue. Nor is it easy to so apply it.

The method, however, employed by us in treating the case described is no tax upon the patient and calls for only a reasonable amount of technical skill. And the many phases of relief granted to the patient during treatment are most gratifying, among them being rescue from cocaine, morphine, and injurious nerve-wrecking drugs.

April 11, 1900, Mr. J———, aged 51, married, has three grown children. For many years smoked six or seven, and of late years, twelve to fifteen, cigars a day. Stopped when cancer was diagnosed. Other habits excellent. A younger brother died November 12, 1897, of cancer of the tongue, eight months after it was first noticed, and three months after operation by a leading New York surgeon. States that no relief followed the radical operation; his brother remained unable to speak and without relief from pain, and failed rapidly. Mr. J——— has refused operation because of his brother's experience and dying advice.

Examination showed epithelioma of left border of tongue, beginning a half inch from tip and extending back two inches. It was one inch wide at middle third, and deeply excavated posteriorly. It had a raised, everted, uneven margin, and irregular, exuberant granulations; was surrounded by a zone of induration, and the nodular mass of the tumor looked irritable and malignant. The floor of the mouth was infiltrated; frænum much swollen; sublingual glands enlarged and hard; submaxillary gland large as a pigeon's egg; parotid gland only slightly affected.

Tongue fixed and powerless; could not lift it to his teeth; impossible to protrude it for examination. Neck muscles indurated, stiff and sore; could not turn head freely; skin sore to touch; dreaded to shave. Face emaciated and anxious; eyes yellow; marked cachexia; mind utterly despondent. Had lost thirty-five pounds in last seventy days.

Pains had been *severe* for six months; were "burning" pains in the tumor, and "sharp and shooting" pains over the distribution of the fifth nerve; often involved head and entire body clear to feet. Had complete loss of speech from April 6th, to date of visit; obdurate insomnia; complete loss of appetite, food disgusts; for six months has not been able to masticate meat and swallow it, owing to fixation of tongue. Fetor and bad taste make nearly all foods repulsive.

In addition to agonizing pains he has suffered from active salivation, soaking nightly eight to ten large pads of thick absorbent cotton with the excessive secretion of the irritated salivary glands of the mouth. Began morphine to relieve the pain six months ago. Three months ago his physician began the local use of five per cent cocaine solution. His diet consisted chiefly of whiskey, eggs, and such liquids as he could take when relief permitted.

It had become impossible to obtain further relief from drugs. He would soak his entire tongue as deep as he could get it into cocaine for two hours at a time without easing the pain at all. Spends his entire day now painting the tongue with cocaine solution. Narcotics had ceased to afford sleep and he would begin at seven P.M. to sip whiskey, often "taking nearly a quart bottle before he could finally get sleep."

Complained of extreme exhaustion; was "worn out"; could barely get to our office. So weak and emaciated was he that a fair prognosis gave him not more than a month of life. The extensive glandular involvement indicated the grave mutilation in case of surgery, and the dying regret of his brother at having suffered operation with added drawbacks and no relief had induced Mr. J——— to refuse to consider the knife. It could promise nothing.

Our sole effort was at first directed to the relief of pain. No assurances whatever were given him. He received no suggestions or promises of benefit (for we never promise a patient anything), but our hopeful experience with tuberculous glands and skin, with chronic ulcerations, with a cancer of the rectum, the pains of incurable pathology, and many conditions associated with great exhaustion and grave suffering, led us to feel assured of decisive palliation with electricity.

April 11th. First treatment removed all pain, stiffness and soreness of neck muscles and sense of fatigue, and refreshed the exhausted nervous system. We urged him to stop all cocaine, whiskey and drugs, and to take all the liquid nourishment he could. He declared that he could get no sleep at all without whiskey, and could swallow nothing now but whiskey and eggs. He was advised to try, and report. Was unable to attend to business since loss of voice a week ago.

April 12th. Reports that he was free from pain when he left our office at five o'clock yesterday, and got better all the way home—an hour's journey. The submaxillary enlargement has reduced one-half, the neck muscles lost their "hide-bound" feeling and were free, and he could *move his tongue.* Some power of speech returned and he felt stronger. Slept three and a half hours without whiskey or cocaine: woke at 1:30 A.M. and had some pain, but soon slept again and did not awake till morning. Went to business and had no pain till nine o'clock. Got through the day with but one application of cocaine.

April 13th. Reports that on reaching home after second treatment he felt drowsy, and retired at eight P.M. Slept naturally till five A.M. without drugs or pain. At nine A.M. pain returned severely and had to use cocaine all day. Upper and lower bicuspids indented the tumor and made it very sore. Treatment removed all pain and soreness. Came in exceedingly exhausted from business and left with the following remark to a physician present who was watching the case: "I feel refreshed, as if I had just woke from a nap, had a bath, and put on a clean suit of clothes." In the street, on his way home, he met an acquaintance who at once came to us and reported: "I have just met Mr. J—— J———; the change in his face is like that of a man who had been under sentence of death and has just got notice of a reprieve."

April 14th. Poor report. Poor sleep; much pain again. Had to drink whiskey and use cocaine. Face pale; is very nervous; *fainted* before he was half through treatment, and was dismissed as hopeless and asked not to return again.

We never expected to see him again after this visit. His grave condition seemed beyond relief. Two physicians present shared this opinion and remarked that he would probably never get here again. This was his last use of whiskey during the three months we treated him.

April 17th. Returned for fifth treatment, with a fair report. Had less pain. Though wakeful at night has been fairly comfortable. The treatment relieved all disturbing symptoms. Were surprised at his return and request to continue treatment.

April 18th. Reports: has used no cocaine for two days, the first time in three months that he was able to entirely omit it. Slept well without whiskey. Is "getting a big appetite." Voice fuller and stronger and uses it all day in business, which is a great strain. Still talks as if tongue-tied, but enunciation is good. When he reaches home after treatment (about six P.M.) he feels like a nap, gets one and awakes refreshed. The cancer looks paler and less irritable.

April 19th. Good report: used no cocaine; had fair sleep; can protrude tongue a half inch over teeth. Has gained eight pounds in weight. Salivation has changed in quality. Is getting more mucous and less watery. Salivation "is now his chief trouble" at night, but he soaks only six squares of Turkish towelling instead of ten pads of absorbent cotton.

April 20th. Eighth visit. Pains slight and rare. Sleeps well. Estimates tongue to be twenty-five per cent smaller than before commencing electrical treatment. It looks, on inspection, as if healing at anterior margin. Can rub his neck muscles and shave without soreness; can protrude tongue beyond lips; appetite excellent. No more fetor or foul taste since first few treatments. Teeth do not now indent tumor or make it sore. Salivation is lessening; glands are smaller; color of face improved: "has had three days of great relief and comfort." Has entirely stopped all use of cocaine, whiskey and other drugs, and does not miss them. "Enjoys his treatment and is eager to receive it."

Space in this small treatise will not permit a daily record of his progress. But the early gains of this man under electrical palliation will be of intense interest to any reader who either has known a similar case or whose fate it may be to have such a case in his family. We therefore continue a little further:

On the 23d he reported: "Eats well and sleeps well. Sleep is natural and restful. Has held up well during the three days since last treatment." On the 24th of April we noted: Face shows animation and decided gain in color. Gain in condition and symptoms goes on. Pain very rare and is only a sharp dart at long intervals; salivation getting less. Voice improved noticeably during last three days. Glands very small now on palpation. On his eleventh visit, April 25th, reported: "Has had a few, sharp, shooting pains in fifth nerve; weight, one hundred and thirty-eight and one-half pounds, a gain of ten and a half pounds in thirteen days. Good appetite and relish for food. Eats nourishing soups, eggs, bread and butter, vegetables, fruit, cereals, milk, etc., but has not tried beefsteak yet." Sleeps well; is more vigorous and is losing the cachectic appearance. Tumor appears smaller, paler, and as if cicatrizing. The granulations look much less exuberant, and mobility of tongue has increased. Can now open mouth wide and manage tongue so as to permit better examination and more thorough treatment. Talking sounds less and less as if he held a pebble in his mouth.

On April 27th, at lunch he ate "a large plate of roast beef for the first time in six months." Head and neck muscles movable in all directions. Glands reduced to a mere shot in size, except the submaxillary, which is still as large as a pea. The entire glandular involvement and infiltration around the cancer has so far been controlled, reduced, and relieved of symptoms. Salivation is reduced remarkably. Last night he only used "one square of towelling on pillow, instead of six required two weeks ago." Mental state and physical condition so much improved as to indicate that the classical cachexia of cancer is largely due to the *secondary effects of septic absorption* and not the direct effect of the primary disease; for having secured ease from pain, elimination of toxins, sleep, and nutrition, he has temporarily regained the appearance of a fairly well man.

At this date felt as if there was "a third less tongue in his mouth," and the former swollen state has been removed from the part outside the tumor. Three physicians who have been closely watching this case now estimate that the growth is reduced one-third. On his fourteenth treatment (April 28th) he said: "Last night retired sleepy at eight o'clock. Slept till three A.M., woke up, turned over and shifted towel under cheek, went to sleep again and did not wake till 5:30 A.M. Tongue has a sense of contracting down and getting smaller every day. It has never felt so well before, since I was sick. Am losing all tired feeling. Fetor of breath has been practically absent. My coming for treatment is like a calf running to its milk. While being treated I am in clover. The benefit is so decisive that I am a surprise to all my family."

Before coming to us to test the efficacy of a high-potential technique this case was seen or treated by seven physicians, and while under our care was examined by ten others; competent men interested in the results obtained. The palliation secured at this date presented the following features:

Relief from the previous constant agonizing pain and suffering.

Return of appetite, relish for food and power to eat a mixed diet.

Return of natural sleep without narcotics.

Return of speech and use of the voice.

Return to business and ability to retain his position for the time being.

Control of salivation to nearly normal.

Deodorization of fetor of breath.

Reduction of infiltrations around the cancer.

Lessening of the cachexia.

Omission of all drugs, notably morphine, cocaine and whiskey.

Emaciation stopped, and gain in weight.

Improved mobility in tongue and muscles of neck.

Mental state changed from utter despair to comfort.

Physical state changed from profound debility to capacity for work.

Reduction in area and size of cancer of about one-third.

All drugs having been withdrawn, as per above records, the sole means of treatment for the entire period from his first visit until July 18th, was static electricity administered by two localizing methods and such other general methods as were called for by the changes in his condition. It will hardly do to question these records of results, for they were daily observed by too many physicians to leave any ground for the sceptic to stand on. Some might like to say that static electricity cannot do these things. Our reply is that we *made* it do them—made it do them by skill, resources of current, facilities of apparatus, and the definite *know how*.

His condition fluctuated during the next month. A full record of the daily progress and of each treatment was presented to the medical profession in our text-book of instruction entitled "Elements of Correct Technique in Electro-Therapeutics," where any one with a personal interest may read them, but here we must condense. On May 8th, he was asked by a visiting physician how the relief he formerly got from anodynes (morphine, cocaine, etc.) compared with the relief from pain that he derived from static electricity. The patient's reply is so illuminating that we reproduce it for educational purposes. It applies to many other lesions than cancer. He said:

> "There is no *comparison*. To get any relief from drugs had become a constant fight. I have soaked my tongue in the cocaine solution for two hours before it would begin to take effect. In the evening I would begin at seven o'clock, and it would be eleven or twelve o'clock before I got enough whiskey and cocaine to let me get to sleep. I felt worse for the drugs but could not do without them. While they dulled the pain for a time, they set up an awful state of discomfort, so that I was failing rapidly. I do not see how I could have lived a month longer in that way. Now I get a perfect relief in five minutes that is like *nature*. It makes me feel naturally well and refreshed and the benefit lasts longer than the drugs I used. After drugs the pains came back as bad as ever in a couple of hours. After this treatment was administered the first two or three times they have never been so bad, and what little pain I have now is nothing."

Sometimes he had partial relapses in his symptomatic state, but usually made a quick recovery of the lost ground. During May and June the heat was excessive for New York, and still he remained able to attend to business. May 26th, reported: "This has been my best and busiest week. Am better in every way. Tumor is now reduced to size it was last August, nine months ago. Ease in eating and swallowing slowly improves." Disregarding symptomatic condition (for lack of space to detail it) we note that on June 5th, "Tumor is very narrow posteriorly; inclusive length now one and an eighth inches, greatest width is nine-sixteenths inch, and the total mass above the floor of the mouth is but a fraction of the tumor on April 11th. Paler, and granulations look more like healthy tissue. June 9th, crest of cancer now seems higher, but thinner. Is rapidly shortening. Formerly covered teeth in front and was indented by them. Now fills only the space between the missing teeth which were removed before our treatment in the hope of easing the irritation. The glands now infiltrated more than previously. Holds his weight but makes no further increase. June 12th. Tumor is fast receding; is so thin and smooth at the outer margin of the entire tongue that it looks almost as if it had been shaved off with a knife. The crest seems about to slough off. July 2d. Cancer shows line of demarcation at base of remaining portion, which is the area of a silver dime only. July 7th. Submaxillary gland is larger this week and has relapsed to about size it was on his first visit. July 13th. "Been too busy to come for treatment. No loss of any kind since last report. Have got along very well." Tumor is a little smaller in area but a little higher in the crest. July 18th, reported had held up strength despite the intense hot wave of that summer. Had been too busy to come for treatments, and had received only five applications in July. At the above date we left the city for a vacation and his treatment stopped. But our note book of the time says:

"At each visit all his disturbing symptoms are removed and remain absent for the remainder of the day and only gradually return during the following afternoon. He does not feel the need of any anodyne or drug of any kind, as what distress he has is mild in degree and easily tolerated. He had fifty-six treatments in all. He has had so far about one hundred days respite from his former agony; has been able to work; has averaged a very tolerable state of comfort; and has been brought from the verge of the grave to a vigor and general health equal to his condition of a full year or more ago. To this decisive palliation by static electricity there have been no drawbacks whatever. The treatment is always a delight to him and gives physiological relief with no disturbing or secondary reaction. When the glands enlarged again the tongue became more unwieldy and speech was thicker. The cancer itself at last visit impressed the attending physicians as if complete healing by granulation was within the bounds of possibility if treatment was continued."

We never saw him again. On our return to the city he failed to return for treatment. Long afterward we learned that he had died during the first week of December following. He had held his gain for a time and then gradually relapsed, but did not resort to drugs for relief until near the end. He had been most anxious to resume treatment—and we especially desired to test the result of persistent treatment—but for the singular reason that a cancer was incurable, his brother (on whom he finally depended) refused to permit him to make any further effort to prolong his life. So, in despair, he died.

# Diseases of the Heart and Lungs.

## With Special Reference to the Cure and Stamping Out of Consumption.

### The Solution of the Tuberculosis Problem in the United States.

TUBERCULOSIS is at once a prime indication for electricity and its nutritional stimulation. The abatement of symptoms is rapid—far more rapid than in patients turned out-doors in the popular but time-wasting tent-camps and the routines of sanatoria for consumptives. Links which chiefly make up the chain of decisive treatment are light, high-frequency and Static electricity, and nutrition.

The most effective treatment possible anywhere can usually be given the patient in half an hour, and the rest of his or her time can be devoted to home or business interests. In the early stages it is decisive. In late stages it will grant grateful palliation, sometimes so prolonging life as to point to an arrest of the process.

In my former clinical classes, I taught physicians the decisive treatment of this disease. With the addition of *Light* the work is still more easily accomplished. In the immense activities of the modern anti-tuberculosis crusade, no plan of treatment is discussed comparable *in simple efficiency and decisive results with the methods which I have been demonstrating for ten years.*

And the increasing experience of years affords the strongest confirmation of my earlier writings. It is my unshakable conviction that the essential principles of the out-door treatment of tuberculosis can be compressed into the concentrated dosage of half an hour in the physician's office, and the whole plan of present-day phthisis therapy should undergo radical modification.—*From "The Modern Light Bath and Some of its Modifications," by S. H. Monell, M.D., New York,* 1905.

# CHAPTER XXII.

## THE MODERN TREATMENT OF DISEASES OF THE HEART.

A Chapter that Should be Read by Every Seeker after Facts.

The chapters that follow make up by far the most important section of this book. They will contain information not only new to the majority of our readers but revolutionary as regards the practice of most of our fellow-physicians in the modern treatment of diseases which affect the heart and lungs.

In this section we shall show that drugs for the heart are in the main *emergency* remedies—futile or harmful in almost every condition which requires the long continuance of treatment. We shall show that the only alternative and hope of the medical profession in both functional and organic diseases of the heart lie in the resources of physical remedies, and they are practical and efficient.

We shall show, as respects Tuberculosis—*consumption*—that the present-day plan of treatment, both that of the family practitioner at home and that of the most approved sanatorium institutions, is a *gross wrong to patients and a fatal medical mistake, shutting out completely the only decisive treatment that medicine contains and supinely trusting to measures which are passive, deceptive and uncertain.*

We shall set forth a more hopeful treatment of phthisis, and shall show the practical solution of this Billion-dollar Problem of Tuberculosis in a form that the community can grasp. We shall teach a perfectly feasible Self-Insurance against consumption which can be made to result in the stamping out of this disease within ten years. And regarding the disease, its nature and the principles of its arrest or cure, we shall enlighten our readers with a plainer statement of facts than is to be found on the same subject in any other writings anywhere.

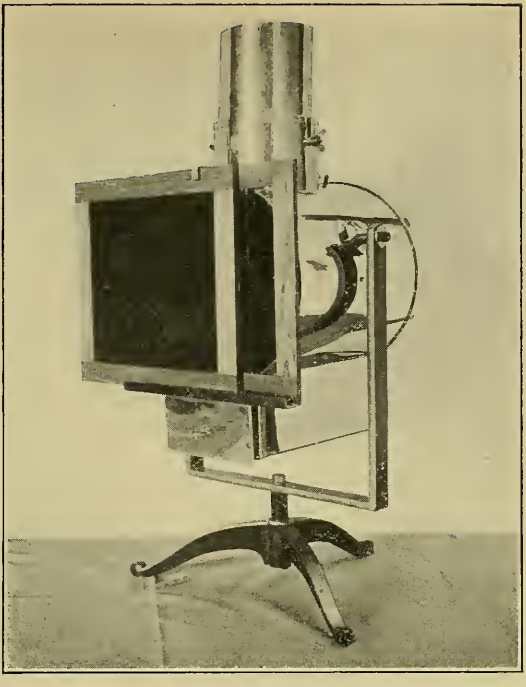
Let us begin first with the heart: The heart is a complex pump and endures a greater amount of abuse with less complaint than almost any other organ in the human body. It is, however, supplied with nerves which set up some protests when conditions elsewhere in the body make its work distressing—and these reflex disturbances of the heart are called its *functional diseases*, in distinction from the organic diseases which affect its own muscles, membranes, valves, or arteries.

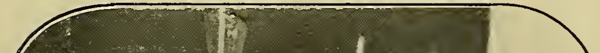
While organic diseases of the heart have many names—pericarditis, endocarditis, myocarditis, the valvular lesions, etc.,—yet they are almost entirely one single thing in essence; that is, they are *inflammation* or they are the *result* of inflammation. If, therefore, the reader grasps the fact that in the treatment of functional derangements of the heart we have to deal only with the reflex neuroses caused by irritations in the blood or in other organs, and in the treatment of organic heart diseases we have to deal mainly with inflammation and its products, it will simplify the understanding of what follows. Far less criticism of electricity as a medical remedy would be made if those who ignorantly question its value were better posted on the very few pathological types it must combat in order to benefit patients.

In the treatment of transient functional derangements, either of the heart or other organs, we most often turn first to drugs because of their facility of action when they suffice. But when the function persists in its departure from normal we must turn to physical agents for more definite results.

The frequency with which internal medication fails to regulate *irregular* functions is one of the greatest regrets of the profession. But yesterday a young lady consulted us in regard to a cardiac neurosis which had made her a semi-invalid for eight years. She was a typical case of neurasthenia. She had taken digitalis, tonics, strychnine, iron, galore; she was taking digitalis now; her physician did not want to give it to her but simply had to; he knew it was harmful; but she felt that her heart would stop without it; and so on through a long history. Furthermore, her devoted physician (whom she adored) had made the most strenuous efforts to find for her some help. He had taken her to a number of specialists; she had "rested" for ten months in the country; she had "tried everything"; she was sick of taking drugs which would never cure her.

Yet the simple and well-known road out of this common condition is down the straight pathway of physiological therapeutics—





THERAPEUTIC ARC LIGHT APPARATUS FOR SPECIAL TREATMENTS

The figures above show powerful arc light devices mounted for adjustment to various positions, especially designed for treatment of pulmonary and joint conditions. The upper figure shows a screen to filter out the red end of the spectrum and furnish chiefly the blue and violet end of the radiant field. In actual treatment the sack seen on the patient will be dropped, as all light rays must be applied through the uncovered skin. A continuous flow of cold water protects the body from excessive heating effects.

the resources of which are persistently placed before physicians in text-books, in medical journals, in much printed matter annually, and yet the patient needing them wanders to the patent-medicine counter or takes inadequate medical sincerity for up-to-date knowledge of progressive medicine. An honest man working in a rut is as a broken reed to lean on for the cardiac neuroses of chronic neurasthenia.

In the first place, what *curative* drug prescription can we write? For direct curative influence upon the heart, absolutely none. Digitalis is a useful, limited, dangerous, and greatly abused drug—next to strychnine probably the most abused of all so-called "cardiac tonics." It does not *cure* any form of heart disease whatsoever. It is rightly prescribed for temporary use only, for it will gradually overstimulate the wearying heart muscle and produce alarming symptoms of collapse. In chronic heart disease a time comes when digitalis no longer acts as a spur and has to be stopped, even when the physician has no substitute for it. It is indicated when the action of the heart is rapid and weak and the arterial tension low, and is contraindicated when the heart is vigorous and the tension high. In some cardiac lesions it is fatally injurious. It is a great emergency drug, but has no curative action on the heart.

In the neuroses, bromides, opiates, and other sedatives make up the sum of much routine prescribing—but of curative actions these remedies have none. Not a single "nerve sedative" will *cure* a single disease of the heart. Does the layman then think that the far greater resources of physical agencies can be at a disadvantage as compared with drugs? It would be hard for the patient if it were so. Fortunately for the medical profession we possess in non-drug remedies an efficient means of doing many things that chemical remedies will not accomplish alone.

One of the leading physicians making a specialty of diseases of the heart (the author of a standard text-book on the subject) ended a medical journal article as follows:

> "In conclusion, I will briefly review our medicinal remedies. Of these, digitalis still continues to stand at the head of the list, whatever theoretical objections may be urged against it. Next in order comes, with a wide interval, strophanthus. It acts promptly and is often useful in emergency cases but is unreliable in action and should not be continued for a long period. Caffeine is a safe and reliable remedy in many instances. All cardiac

tonics should be used cautiously in a fresh exacerbation, such as may occur in rheumatism.

"In this connection I would warn against the use of strychnine. In the neurotic forms of chronic functional disturbance—bromides and other sedatives, or even preparations of opium, may form essential parts of the treatment; but we may be able to succeed without them by the use of sulphonal or paraldehyde. Such has been my experience."

The above should certainly prepare the average reader to lose part of his general idea that physical agents must necessarily be inferior remedies in the treatment of the heart. The co-operative assistance of drugs is many times essential in diseases of the heart, but the chief part of the treatment is beyond them. Our other resources are safer and better palliatives, and more frequently curative when a cure is possible.

In the principal chronic disease of this wonderful organ, hygiene, diet, and selected drugs supply the foundation rather than the superstructure of treatment and the most decisive measures remain to be added to them. As some of the most serious depressions of the heart are but the secondary burden placed upon it by the state of the general circulation, the blood, nutrition, excretion, or disease in other organs, it follows that a prime necessity in the treatment of the heart is first to ease it of superfluous tax upon it.

Treatment of the whole patient and not the heart alone confronts the medical prescriber. We cannot single out this one organ and fit it with a cure. But experience has taught that when the rest of the body is nearly right the heart will try to right itself, and from this fact we take the elementary principles of treatment. We search the patient for diagnostic guidance and we search the resources of physiological therapeutics for remedial actions. The great trio among these resources consists of electric light radiations, selected electric currents, and the electrical Nauheim bath.

In Heart diseases, both functional and valvular, the nutritional-alterative-sedative-tonic actions of light rays (the chemistry of the Sun) are of exceeding value. The dilatation of the capillaries, the tranquillizing effect upon the nervous system and the elimination of morbid products, contribute a relief to the heart which must be experienced to be appreciated. Complications at times exist which may call for special care in the use of the light bath, or its omission altogether for a time, but, in the main, it is of great value and can hardly be replaced by any other measure.

What can be done for the aid of cardiac conditions by the regular resources of electric currents may be judged from a perusal of this and our other books. We have treated many cases of Heart disease with the aid of electricity of one form or another and set nothing down here save the demonstrated teachings of personal experience. We know what we can make electric currents do because we have made them do the things we say they do. And in their sustaining power upon the heart itself electric currents act, not as a mere stimulus, but as true nutrition, feeding the tired organ with refreshing energy, sending into its arteries a better blood supply, calming its excited nerves, and imparting to it the intrinsic benefits of a rest it cannot take.

To this sustaining energy of electric currents there is none of the reaction and debility which follow the whip of alcohol to the jaded heart. The true cardiac tonic is good blood circulating in the organ, but the next best source of invigoration is found in electricity—and its use by correct technics. It is safe, more certain than any other tonic, and can be applied to almost every non-febrile pathological state.

The next of the important trio is the carbonic-acid bath called after the Nauheim springs of Germany. Some 30,000 patients, mostly cases of heart disease, visit Nauheim yearly. The treatment there is made famous the world over by the gossip of travellers, the publicity of the press, and by advertising circulars, etc. But we have never yet seen a cardiac case that we should be satisfied to let go to Nauheim, or a case of diabetes or nephritis that we would feel satisfied to let go to Carlsbad, for the reason that the methods of these European resorts (and we have been there) seem too narrow in their scope and to partake too much of a commercial routine instead of fine medical practice.

Skilled treatment is not a commercial commodity for sale at so much per so many "baths." The hoped-for and desired results can only be worked out by laborious attention to detail and a careful study of measures to adapt them to meet obscure and complex indications, and no one but the competent practitioner (not a bath attendant) will succeed with the majority of such cases.

Commercial enterprise has placed on the market a variety of salts or solutions to enable persons to take an "artificial Nauheim bath" at home, and they have some value when better treatment is not available. But by the aid of drums of compressed carbonic acid gas and a special mixing device we command the far superior genuine Nauheim bath of the native spring—with the additional value of American instead of German after-treatment. We also can combine with our charged water a tonic sinusoidal or galvanic current which adds to the efficiency of the action and cannot be used with the German water nor with the artificial salts.

But the Nauheim technic is but one feature of the treatment required in cardiac lesions. The after-treatment is essential and important. In the routines of health-resorts this consists mainly of massage and rest, but the fame of Nauheim is most associated with the "resisted movements of Schott." These movements are flexion, extension, abduction and rotation, applied to the limbs, neck, and trunk. A half hour or so is devoted to them. In five minutes we can far surpass their utmost possible benefit to the patient, simply by the rational use of an efficient electrical technic. Surely no one but a man ignorant of electrical currents could ever have wasted his time on the "Schott system." For patients it is so inferior to our own method as to be out of the pale of serious consideration.

Nauheim itself, is not a "cure" for heart diseases. The German word "kurhaus" means, not a cure-house where patients are cured, but simply a treatment-house where they undergo treatment. No one is cured at Nauheim any more than elsewhere and they expect the patient to return year after year for the season, as long as life and money hold out.

Functional diseases of the heart, however, may hope for a positive and permanent cure under sufficiently persistent treatment. Sometimes the conditions are quickly regulated and sometimes it takes a long while. But the average period of treatment by physical agencies will probably be less than one-tenth the time that some of these cases linger under exclusive drug treatment without a cure.

Chronic organic lesions of the heart do not expect a radical cure of the primary disease. They hope for relief from symptoms, a reasonably improved condition of general health, and the comfortable prolongation of life to the utmost endurance of the damaged organ. This expectation is well aided by the resources of physical therapy and those who lend judicious co-operation to this treatment are gratified. Results are substantial, often brilliant, and rarely an entire disappointment.

The first thing for a patient with heart disease to do is to seek the help of proper treatment and then to stick to it until the limit of benefit is attained. When a relapse occurs resume treatment until new energy is again restored, and with care in this way the full term of life can be enjoyed—forgetting from the mind the thought of "heart failure" and the hunting fear of "dropping dead" which is in reality the fate of an exceedingly small fraction of the myriads of people that walk our streets with something the matter with their hearts. Some of the worst fears are caused by hearts that are entirely curable. Some of the least curable states make so little trouble that they remain unsuspected for years.

# CHAPTER XXIII.

## THE STATE OF LESSENED TISSUE-RESISTANCE.

How Physical Vitality Below Par is Related to Diseases of the Air Passages. The Obvious Art of Resisting Microbes. A Synopsis of Facts that Ought to be Taught in Every School.

To prepare the reader to grasp the rational way in which an electric current can be made to take a prominent part in the treatment, prevention, and cure of practically all inflammatory diseases of the respiratory tract, from a common cold to consumption, it is necessary to first make it plain that sound tissues are the main capital of the individual in fighting diseases of all kinds, including diseases of the lungs. None can realize how easily it is possible to make an electric current apply efficient treatment to a chronic nasal catarrh, or pleurisy, or bronchitis, or consumption, unless they first take into account the way that Nature "throws off a cold," as the common saying is. The secret of Nature is "tissue-resistance."

By this phrase is meant the normal resisting power of the healthy tissues of the body to exposure, the wear and tear of work, and the influences which cause disease. It is the essential physical *vitality* of the individual, not merely his ability to lift a weight or do a certain amount of work. When this tissue-resistance is at the normal value which we call *par* the organs and fluids of the body are proof against many diseases that attack others, and will heal very quickly if injured or otherwise sick. Normal gastric juice will *resist* the germs of typhoid; pure blood will destroy many micro-organisms and *protect* the individual from their inroads; when tissue-resistance is at par the person cannot have a chronic "cold on the chest" for he will speedily get over it, and he cannot acquire consumption for the tubercle bacillus will not grow in sound soil.

But one of the marked characteristics of a reduced state of normal resistance in the tissues is the increased liability of the individual to suffer from slight exposure, to take cold easily, to more easily feel fatigue, and to lack the vital energy of the sound state. In our northern climate this tendency to "catch cold," and susceptibility to the invasion of microbes, are the two most common evidences of a reduction of the tissue-resistance below the standard of physiological *par*. If this standard is restored by prompt treatment the acute disease is quickly overcome by the energies of nature inherent in the living chemistry of the body. If it is not restored disease tends to become chronic. In order to "cure" (eradicate from the system) many diseases it is merely necessary to build up the tissue-resistance; then "nature" will do the rest.

The essence of this normal tissue-resistance may be considered *a tonic state of the protoplasmic cells of the tissues*, and the sustaining power of this essential tonicity resides in *nutrition*. Deviations from normal nutrition reduce the toughness of the protoplasm and in so far as it is imperfectly nourished it is weakened and makes less vigorous defence against enemies always on the alert to attack the human body.

We have seen in the early chapters of this book that some of the chief actions of electrical energies are exerted in the energizing of impaired powers of nutrition; and in promoting an increased capacity of the tissues to take up more oxygen, more food and more active functionation, electricity becomes the decisive means of restoring and maintaining the resistance of the tissues at the nearest approach to *par*.

It is customary to think ourselves well unless we are *sick*—the common understanding of "sickness" being something that confines us to the house or puts us in bed. Few stop to consider that when they are "a little below par" they are really as much in need of building up their health as if they were forced to "lay up for repairs." It is certainly conservative to estimate that, taking our population as a whole, a very large majority are twenty per cent below par in their powers of tissue-resistance. Let us look a moment at the consequences of this general impairment of protoplasmic vitality.

In our changeable climate "colds" abound. At some seasons of the year they are like an epidemic. An increase of twenty per cent in their tissue-resistance would enable most persons to "resist" exposure to weather, just as the healthiest do. Those who catch cold from severe exposure when near the normal *par* tend to regain their health in half or quarter the time consumed by others in recovering from a cold.

With this protective invulnerability to simple colds the present frequency of bronchitis and its chronic effects upon hundreds of thousands each year would abate at least two-thirds. When a man has bronchitis he loses some of his ability to accomplish work, even if he keeps at work. Bronchitis annually lessens the productive energies of this country by an amount that would subsidize our merchant marine and renew its supremacy on the seas. Normal tissue-resistance, obtained when lost by the nutritional actions of electric currents, affords the inexpensive self-insurance against most of the waste of colds and bronchial affections, including tuberculosis.

When the "grippe" is prevalent the best protection of the individual is a normal state of tissue-resistance, for the leucocytes of healthy blood repel the germs of epidemic influenza. If attacked despite a fairly healthy state the person will be able to recover in a few days with no bad after-effects (and electricity affords the certain means of enforcing a quick and complete recovery) while many other cases linger for a year or several years in various debilities resulting from the grippe.

In the epidemic of 1900–01 there were 52,000 deaths in New York State from this disease which in the main attacks only those who are below par—more or less "run down." Besides the great number of deaths directly due to the grippe five times as many survivors were weakened by its effects. When a passenger is killed in a railroad accident the company pays a minimum of $5,000.00 for the loss of life. At the same rate the grippe in a single year lost to New York State the equivalent of two hundred and sixty million dollars. And this fails to take into account the personal suffering caused by the disease, and the long-lasting disabilities of many survivors. Both the economic loss and the suffering can easily be reduced seventy per cent by promptly treating each case with proper electricity and by a general regard to the maintenance of normal tissue-resistance.

Typhoid fever attacks few people save those that are "run down" below the normal state of resistance, for a healthy stomach can swallow the germs of this disease with impunity. Pneumonia is another widespread disease which is resisted by normal tissues and only attacks those whose powers are below par. Its fatality is largely due to lack of recuperative power and it deprives this nation of more eminent citizens than yellow fever, cholera, typhus, cancer, leprosy, and all forms of pestilence from which people flee with dread—and a hundred thousand deaths a year from pneumonia will not raise a ripple of excitement in the United States. A lifting up of the average tissue-resistance by twenty per cent would place these great causes of mortality low down upon the list.

Consumption is a disease of *lowered vitality* and all that is needed to emancipate us from it is a normal state of tissue-resistance. *That is all*, and the average individual can obtain the essential resisting power by utilizing the nutritional-tonic energies of electricity. The economic stake of the nation in a better tissue-resistance and emancipation from consumption is reasonably represented by the following figures.

When a person becomes infected with the tubercle bacillus his market value is marked down. His insurable value is lost. His productive capacity loses from ten to twenty or thirty per cent a year, and becomes a *minus* quantity when he can no longer work and some one has to support him. But assume that we have one million consumptives whose earning value is reduced an average of $100.00 each. This is an impaired productiveness of $100,000,000.00. If 150,000 are in the helpless stage and dependent on others to the extent of $200.00 a year this adds $30,000,000 annual burden to the community. One hundred and fifty thousand tuberculosis victims die each year, and computing a life at $500.00 only (not the $5,000.00 of the railroad accident law) the economic loss is $75,000,000.00. While the disease goes on unchecked the nation is thus taxed two hundred and five million dollars a year by this merciless assessor, and this sum measures our economic stake in an improved tissue-resistance, only with respect to one penalty of lowered vitality. What can be done in behalf of a given individual is always uncertain in medical practice, for medicine is not an exact science, but *it is not uncertain nor open to the slightest doubt that the medical resources of electric currents and correct technics can be made to raise the average of physical vitality to par or near it in an enormous majority of all who seek to do it.*

And it is of the utmost importance that the living units of this nation should be made aware of the true relation of tissue-resistance to respiratory diseases. Every school child should know that from hay fever to consumption the predisposing cause of all is essentially the same pathological principle of a *reduced tissue vitality.* And every child should also be taught that the medical principle of reconstructing the tissues to normal *par* resistance is the same in all cases, and applies to each and every individual who is in any degree "run down."

When respiratory diseases are looked at from this rational standpoint the principles of prevention are seen to be extremely simple and the principles of cure no less so. For in these conditions we have the potential aid of the *Vis Medicatrix Naturæ* working for every patient, and as we trace these things through the next few chapters the force of our argument will become still plainer.

# CHAPTER XXIV.

## THE CAREER OF A "COMMON COLD" FROM THE NOSE TO THE LUNGS.

Showing the Downward Course of a Single Inflammatory Process Under Different Diagnostic Names, and the Essential Principle of Treatment.

WE here begin to trace the insidious origin of pulmonary tuberculosis. The starting point of consumption in the majority of cases is *susceptibility to a common cold*, and we shall take the reader along with the inspired air from the mucous tissues of the turbinates in the nose to the ultimate air cells in the lungs.

A "common cold" may affect the vascular lining membrane of any of the cavities of the body. Following the initial congestion an acute inflammatory condition may suddenly develop; or the process may be slow, chronic, and without fever. Diseases of all kinds which last a long time are called "chronic" from the word *chronos* which means *time;* while those from which we rapidly recover are called acute—coming quickly to a point.

The prevalent common colds of this latitude present two phases. On the one hand we see a cold occur from exposure to draught on the part of a person in good health, and with (or even without) treatment this cold speedily disappears completely and leaves no trace. Here we have a high tissue-resistance protecting the patient from chronic effects.

On the other hand, many persons are "subject to colds." They take cold easily and get well with difficulty. Often, the cold does not wholly disappear. A remnant lingers with inveterate persistence to be revived by a fresh attack and perhaps only ceases its winter manifestations when summer comes again. These conditions of low tissue-resistance vary in different individuals from simple snuffles or a gentle cough to a troublesome bronchitis. The millions thus afflicted may not altogether neglect medical treatment, but despite treatment by routine drugs they are subject to renewed exposures which prevent or delay their full recovery.

The "predisposition" which makes them subject to these colds is a state of lowered tissue-resistance due to some generally ascertainable cause. It may be the temporary relaxation of the moment, an acute fatigue, a restricted diet, an inherited frailty of constitution, the sequel of some disease of childhood, a recent illness; or it may be part of the wear and tear of the struggle of life, or the gradual depression of an unfavorable environment. Any person overworked or dwelling in a vitiated atmosphere may acquire the lowered state of the tissues which invites a cold on every slight exposure. We once knew a young man so susceptible that he could not open a closet door without taking cold from the draught.

Between the first entrance of inspired air at the nose and its deepest penetration of the lungs the lining membrane of its passage resembles an avenue with different names for different sections of the single street. A cold affecting a given section takes its name from the affected part. Thus, a nasal catarrh is in the nose; a coryza is a simple cold in the head; influenza is the technical name of the grippe; when the vocal apparatus is affected it is laryngitis; next door to this is pharyngitis; and passing down the trachea and attacking the bronchial tubes it becomes bronchitis.

Beyond the branches of the bronchi are the air cells of the lungs, and covering the lungs is the membrane called the pleura. When this is involved in the inflammation it is called pleurisy. The great acute disease of the lungs beyond the bronchi is pneumonia. All of these names are familiar and they are but different degrees and locations of a *single* pathological process—until a new foe enters the field and plants on the receptive soil the *tubercle bacillus*. When this occurs the progressive "cold" has developed into the grave disease which has three names—consumption, tuberculosis, and phthisis—and which, the world over, destroys five million people per year.

Of the thirty or more diseased conditions of the air passages recognized in scientific diagnosis we shall now take, each in turn, the nine in which electricity is especially interested; and it may arouse the wonder of readers to learn that the most neglected of remedies for these conditions is the most decisively curative remedy known.

Beginning at the upper air passages we first have "acute coryza." It is popularly known as a "cold in the head." It is usually an independent affection but may precede the development of another disease. Many cases are so mild that patients attend to their usual work. Severe cases have fever and constitutional disturbance.

A proper medical prescription taken early in the first onset of a coryza will usually check it in persons in fair health. Once well started it passes through the essential career of inflammation, but recovery can be hastened and insured by drugs. But in the first congestive onset electricity is also an efficient means of arresting the process. Not necessary when camphor or aconite or belladonna suffice, but efficient in its own way and when they fail. The anti-congestive action of a radiant-heat bath followed by the circulatory regulating action of static electricity will be found not less decisive than aconite, and effective with greater promptness when the time for the best work of the great drug has somewhat passed.

When the time for arrest of the process has gone by we can then far surpass the action of any drugs by the more decisive actions of electricity in shortening its course and hastening a quick and complete recovery. Many cases of acute coryza occurring in patients coming to us first with other infirmities have enabled us to demonstrate the unsurpassed efficiency of selected electrical methods in the treatment of colds in the head.

If, however, the first cold in the head is not entirely corrected, and repeated exposures to irritating air follow, the second state of the now chronic inflammatory process is often "chronic nasal catarrh."

This disease, the technical name of which is Rhinitis, has two long-lasting stages of pathology: the first, in which the mucous tissues lining the nose to moisten, filter and warm the cold and dusty air we breathe, are swollen and congested; the other, in which these tissues finally degenerate, waste, and atrophy. The fœtid offensive breath of advanced catarrh is the "ozena" of this stage. Electricity can be made to deodorize it and arrest the atrophy.

Generally, in time, the process involves the mucous membrane of the pharynx and the Eustachian tubes, causing the ringing in the ears and partial deafness from which some of these cases suffer. Chronic rhinitis is not incurable in the medical sense, but it is not easily "cured" to stay cured under the conditions of modern treatment. Many remedies will afford palliation, but our winter climate and the expense of competent treatment are the two main reasons why temporizing measures of delusively nominal cost are popular with the public.

The chief relation of the lesion of rhinitis to bronchitis, tuberculosis, pneumonia, or any other disease of lowered vitality, may be considered as follows: A person who has any local lesion of long standing that does not heal is not *well.* Any local or general state of lessened tissue-resistance opens a gate to the invasion of any other disease to which the person may be exposed.

It is a general principle. The special application of it is individual, and as true of one part of the body as it is of another. If the skin is sound you can run your hand through poison with impunity, but if the skin is cut by the merest scratch—an ordinarily harmless scratch—blood poisoning may result. So also a sound mucous membrane will not absorb germs that are inhaled daily in the air, while an eroded patch in the membrane can afford lodgment and fertile soil for the growth of bacteria.

To make a decided improvement in these catarrhal conditions in the nose and throat is not at all difficult with appropriate electric currents and technics. The healing properties of an electrically charged ozone spray applied to the membranes is antiseptic, anticongestive, corrective to the secretions, and very healing. It is easily employed and with other measures is one of the most satisfactory treatments known. In a few treatments it will generally produce a marked improvement, and a reasonable period of treatment will relieve the condition of nearly all its drawbacks—but to carry this sixty, or seventy, or eighty per cent of gain to an entirely normal and permanent state of healthy nose is quite a different matter in our climate. It would be no trouble at all if (after treatment) the patient met no raw air and only soft and balmy weather. Nevertheless, the improvement in the nose and general health obtained at the same time is well worth while and neglect of rhinitis has its costly penalties.

The third disease of the air passages has several classical names but is popularly known as Hay Fever. It is a peculiar catarrhal inflammation of the upper air passages, often associated with asthmatic attacks. It is more common in the United States than in any other country. It was first described in 1819, and is the

"Rose Cold" of spring, the so-called "June Cold," and "Autumnal Catarrh," as well as "Hay Fever."

The erroneous opinion prevails that it is incurable and that the chief palliative is a selected climate. A recent medical journal estimates that there are now 200,000 victims in the United States, with the number steadily increasing. The U. S. Hay Fever Association was organized about 1874–75 by Henry Ward Beecher whose annual affliction gave greater publicity to this disease than it deserved. Climate and drugs palliate the disease and have no curative action; we shall show in another chapter how readily curative it is possible to make the resources of medical electricity. For the present we leave it to consider the minor lesion of chronic laryngitis—the extension of inflammation into the organ of speech.

Every one is familiar with the hoarse rough voice, or loss of voice (aphonia) that accompanies this invasion of the vocal apparatus. In the case of children and of many adults it is due entirely to cold, but in persons who sing, lecture, teach, or tax their voice, it may become the condition known as "Clergymen's sore throat." Stump speakers are likely to develop it. When it does not quickly yield to routine prescribing the decisive measure of treatment is electricity.

It can be made to clear up any case of a benign nature, and when properly selected methods do not promptly give the usual rapid improvement it is certain that some more serious cause prevents. The two chief lesions of a malignant character are cancer and tuberculous ulceration of the larynx. In the former case we are helpless; but in the latter we have in the various energies of electric currents and electric-light rays the means of giving a hopeless patient the greatest amount of relief, and of holding the process in long abeyance, or even healing it entirely in cases of moderate damage and not too advanced a condition of the lungs. The curability of early stages of all forms of tuberculous ulcerations is admitted and electricity is the one decisive means of cure.

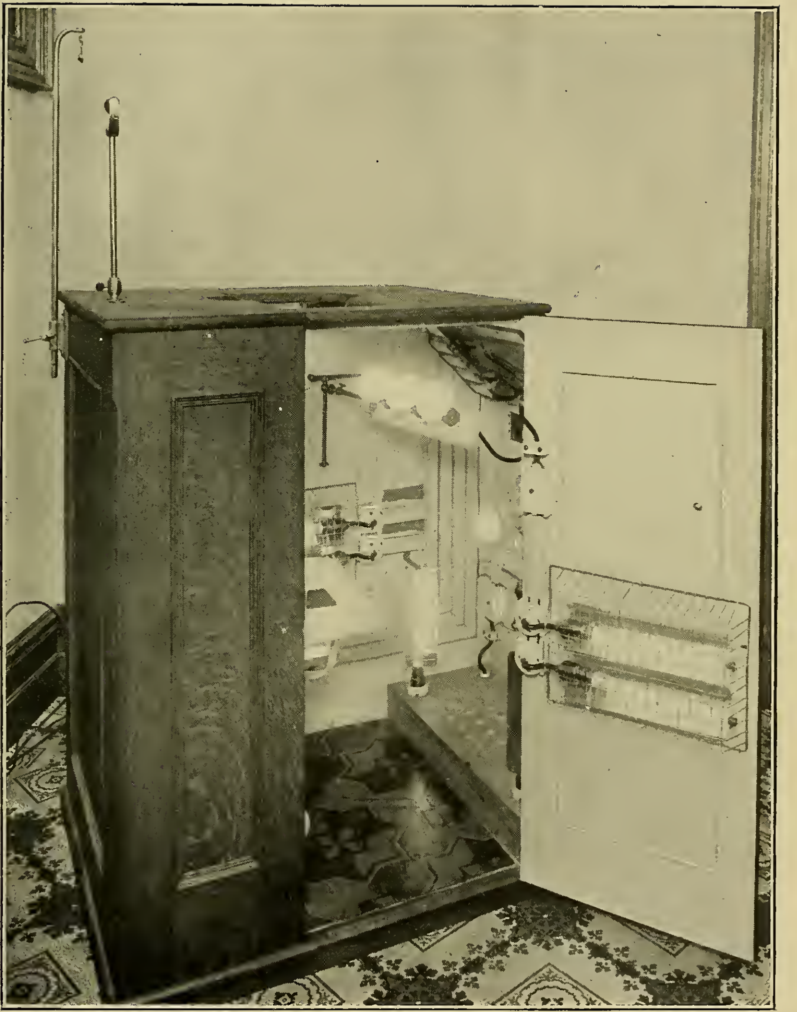
Tonsillitis may be mentioned here. When it clears up properly under medication we need no other remedy. But later we may need to remove soreness or stiffness in the neck in some rheumatic case and electricity does it promptly. As a matter of clinical demonstration we have, however, proved that a sedative-vaso-constrictor application will abate the congestion of the onset, and reduce the inflammation of the acute attack, and remove the pain, and do all and even more than any of the classical drugs that are preferable in general practice because of their convenience and usually satisfactory action.

The fifth step in the descent of a simple cold along the respiratory mucous membrane is the important and common disease called *bronchitis.* It may be either acute or chronic, mild or severe, simple or complicated; may be either a primary invasion beginning in the chest or the terminus of a cold that began in the head and crept down. It is seldom fatal in the vigorous adult but has a high mortality in the old, the debilitated, and the very young, owing to associated impairment of the functions of the lung.

The bronchitis of Bright's disease, gout, heart diseases, and consumption is a chronic form. Chronic bronchitis may follow repeated attacks of the acute affection, or be left after an unresolved pneumonia, but is most commonly associated with chronic lung, heart, and kidney diseases, and states of lowered general health. It is the "winter cough of the aged," quiescent in summer, returning in winter for many years.

We thus see that while acute simple bronchitis is a "cold on the chest," yet the chronic and stubborn form is less a cause of other diseases than the *result* of them. This explains the failure of medicine—especially of quack nostrums—to radically cure the catarrhal bronchitis of this type—the smouldering embers of a low grade of inflammation in tissues of too reduced vitality to heal. And for lack of cure and the troublesome cough there has grown up an enormous abuse of opium in cough mixtures and expectorants that mask the symptoms and leave the patient with the disease unchanged.

The one decisive remedy for all grades of this bronchial condition and its associated lessened tissue-resistance is *electricity.* This may seem difficult to grasp for those who see nothing in sight but a toy battery and a pair of toy sponge electrodes—fit for nothing medical: but let us subject these clogged-up capillaries of the skin to the eliminating action of luminiferous radiant heat; then react on the dilated blood-vessels so as to send a freshened circulation vigorously through the lungs; then let us energize the elastic contractility of the muscle fibres of the thorax—the apparatus which does our breathing by expanding and contracting so as to open and close the air cells of the passive lungs; and follow this with a vigorous toning up of all the muscles and nerves in the



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body; and still further, rest and refresh the heart, increase the power of the tissues to absorb more oxygen, take in more food, obtain more sleep, and forget the cough and pain. Let us use electrical technics that will make high-potential and efficient currents *do these things* and the rational treatment of the bronchitic patient takes on a different aspect. *And he gets well.*

A month of such treatment accomplishes more lasting benefit to the victim of "winter cough" who is told by her family physician that she must go south for the winter, than fifteen years of cough mixtures, tonics, sedatives, and travel. The only curative agencies for these conditions reside in physical therapeutics. Many years of experience with cases in which drugs have failed have taught us the superior efficacy of electric currents rightly administered. They do the work on the patient single-handed. Not a drug is needed. They enable the patient to remain in any climate he or she desires. They cannot utterly fail to benefit the patient in the severest and most complicated case. They will produce a very large measure of improvement even when lesions of the heart, lungs, kidneys, or other organs make a total restoration to health impossible. The healing powers of Nature in improved blood, energized muscles, increased functional nutrition, and especially in the increased amount of oxygen carried through the lung's cells, can hardly be pictured by the lay mind as it is taught the physician. But to form a mental conception of the workings of these resources of nature in the living body is to grasp at once the fact that no other remedial agencies except electric currents are competent to produce the actions that so decisively invigorate "Nature." For her, with this assistance, to heal up the ordinary bronchitis is only a question of a few weeks. Every one should know this, for neglect of any lesion of the lungs is a physiological error.

Bronchial *asthma* is another variety of this disease which taxes the heart and lungs and still further impairs vitality without being directly a cause of death. A few spasmodic conditions are amenable to remedies; the spastic states of central nervous diseases are seldom found improvable by any form of treatment: the asthmatic paroxysm is about midway between. Some cases improve greatly —more in a couple of months of electrical treatment than after various years of medication. Some paroxysms abate entirely during the action of a high-potential current in general electrification. Local treatment of the respiratory apparatus has in some cases gradually lessened the frequency and severity of the spasms and greatly decreased the amount of bronchitis present. But owing to the vagaries of this disease, its reflex and distant causes, and the inveterate tendencies of the general condition, it is not possible to say of any case in advance that a given degree of benefit can be assured. Yet the only real substantial treatment between the paroxysms is by selected electrical energies, for other remedies are still less efficient.

What leaves are to the trunk and branches of a spreading tree the pulmonary air vesicles are to the trunk and branches of the bronchial tubes—in anatomical appearance resembling a tree upside down. Both the leaves and the vesicles are the means of utilizing air to support life, taking the oxygen of the air to the walls of the thin adjoining blood-vessels in the lungs. Through these delicate permeable walls the oxygen passes by osmosis into the blood where it fastens upon the red corpuscles, and is carried by them throughout the tissues of the entire system, feeding itself out as it journeys, until, when it reaches the venous capillaries, none is left and the veins carry back the hungry blood for more oxygen.

It is obvious that when an inflammation attacks the air vesicles it is a serious obstruction to the power of breathing, for air and inflammatory exudates cannot both occupy the same space at the same time. The exudate clogs up the air passages and the patient partially starves for want of enough air.

This is the case in the next respiratory disease we must consider, *pneumonia*. It is an acute inflammation involving the vesicular structure of the lung, rendering the respiratory cells impervious to air in the lobes that are inflamed. Fortunately it is often limited to one or two lobes, for if all were closed to air not a patient could survive.

Pneumonia is most common in winter, as are all other "colds," and is sometimes epidemic. The direct causes are exposure to draughts and cold, wet, or sudden chilling, injuries to chest walls, alcoholic excesses, gout, rheumatism (or a specific germ), grafted upon a predisposing state of lessened tissue-resistance, and scarcely a single case occurs in a really normal person. It requires the invitation of the "run down" condition to produce pneumonia.

It is a grave disease. Its rapid invasion and swift destruction of life has often startled the community when some man of note has been its sudden victim. Some eighty thousand people a year die of it in this country and some two or three hundred thousand others have it and survive. In those that survive, infectious processes are a common secondary sequel, and it is this fact which imparts the greatest interest to a decisive means of ending the pneumonia when the patient gets up, and eradicating the infectious process before it spreads.

When the inflammation in the lungs does not entirely heal we have what is called in medicine an "unresolved pneumonia," of which the patient is not aware, for only the physical examination of the doctor can detect it. But upon this common left-over, sore spot in the lungs there sooner or later alights the tubercle bacillus and starts a colony. A large number of cases of consumption begin in this way. Every case of pneumonia can be absolutely finished to complete healing of the tissues if the patient will obtain proper electrical treatment as soon as the advance of convalescence permits him to leave the house.

It may also be possible to prevent the development of pneumonia by prompt and energetic treatment of the prodromal stage, and we have had a case in which the disease appeared to be so modified that the patient recovered in three days. The main prophylaxis, however, is to realize that debilitating causes of all sorts render the lungs more susceptible, and that the disease is most apt to occur either soon after a wetting or a chilling from some unusual exposure, or comes on after an ordinary cold of two or three days' duration. The energetic anti-congestive, counter-irritant, stimulating application of a high-potential current to the chest and spine, preceded if necessary by an eliminating light bath, can certainly be made of great restorative value in this preliminary stage.

Moreover, as no acute disease of the lungs is so liable to recur or relapse—31 per cent of all cases have more than one attack—it is of the highest importance to recover a normal state of protective tissue-resistance immediately after the first attack and to maintain it during successive years, so far as can be done by careful living and a week or two of upbuilding by electricity at the approach of each winter season. The treatment of pneumonia from this standpoint is one of the most satisfactory things in medicine.

A common complication of bronchitis, pneumonia, and tuberculosis is *pleurisy*. It is divided into two classes; a *dry* inflammation and an inflammation which is followed by an *effusion* of serum into the pleural cavity. It may be either acute or chronic. The primary acute disease has long been regarded as the result of a chill or exposure to cold—the same as all other "colds" in any part of the respiratory tract; but modern investigators think differently. They hold the opinion that in almost all inflammations of serous membranes "cold" is only a predisposing agent which makes a sudden breach in the tissues for micro-organisms to enter. This theory of chronic pleurisy is now accepted by all physicians.

But no matter whether the pleurisy is an extension of microbes from a pneumonia, an infected bronchitis, or tuberculous lungs, the decisive measures of treatment are found mainly in the resources of physical therapy. In the dry form the penetrating counter-irritation of a high-potential electric current has nothing comparable to its action in medical experience. In the case of an effusion which does not absorb under the same treatment, aspirate it as usual and then renew electricity. We can write no drug prescription that will directly act in a curative manner upon a delayed pleuritic process and command it to heal. But we can apply an electric current with a method of technique and dosage that will urge forward the process of recovery so that each day the lesion will be less and will quickly be at an end.

Some may think it impossible to do this with electricity in the pleuritic involvement of consumption (and sooner or later nearly all cases of consumption suffer from pleurisy and its pains), but we have never failed to relieve the pain and abate the pleuritic process, even in the most advanced stage that is able to attend for office treatment. In all early cases the pleurisy is one of the first things to benefit, and the removal of this impediment to free respiration is an immediate advantage to the patient.

The diseases we have thus considered are examples of the penalties of a lowered state of the disease-resisting properties of normal blood corpuscles and the cells of protoplasm in the body. When we combine an already lessened tissue-resistance with an unhealed lesion of the air passages which still further depresses the vital energy, we develop the *predisposing* conditions from which consumption always grows.

Pulmonary tuberculosis starts in no other way. It cannot get a foothold in a sound lung. The way to keep it out is, therefore, to maintain a healthy state of the air passages, and if they are attacked by any acute and curable disease we should seek the most immediate and decisive restoration of the tissues again to normal. In the great majority of cases this is not difficult to do. And the reward is a practical immunity from ordinary microbes and a long policy of *self-insurance against consumption.* On the other hand, there are penalties attached to neglect of colds and a run-down condition which may well cause us to ask whether an ounce of prevention is not worth a pound of cure. All who regard sickness as better and cheaper than health can obtain their heart's desire by neglecting a common cold often enough and long enough.

There is one other disease of the air passages which possesses a peculiar interest for the following important reasons: when it is epidemic almost everybody has it; it is one of the most depressing of respiratory diseases; it is acutely prostrating and is succeeded by a long period of lessened tissue-resistance; as a predisposing cause of consumption it is without a rival. We refer to the influenza of microbic origin known everywhere by this generation as *la grippe.*

While not, at this writing, a present epidemic, yet cases of it occur and when it again invades the community in force it will be well for our readers to know what it is and to also know that its sufficient and conquering remedy is electricity. A disease that paralyzes business, overflows the hospitals, destroys 52,000 lives in a single year in a single State, leaves in its train a score of formidable sequelæ, and is the most prolific producer of consumption among epidemics, may well carry us into another chapter. The grippe has a peculiar relation to the lungs even when it does not attack them, and before explaining the pathology of the deadly *tubercle* we fitly may spend a moment with one of its most frequent causes. Our next chapter will speak of influenza-grippe.

# CHAPTER XXV.

## AN ACCOUNT OF INFLUENZA-GRIPPE AND ITS EFFECTS.

Describing the Nature of this Great Epidemic Disease and the Remarkable Debilities it Produces. Also Showing that the Most Decisive Remedy For all Stages of the Grippe and its After-Effects is Selected Electricity. Examples of Various Clinical Cases and the Results of Electrical Treatment.

Ordinary "influenza colds" are constantly present in the community, but since 1889 they have been displaced in public fancy by the more strenuous *influenza vera* now universally called the grippe.

Great pandemics of the disease have been recognized since the sixteenth century. There were four in this country, with their succeeding epidemics, in the nineteenth century—1830–33, 1836–37, 1847–48, 1889–90 to 1901. The last began as others before had done in some distant province of Russia. In two weeks it spread from Moscow to Berlin. In a month it was in both London and New York and was widely distributed over the American continent. Within a year it had visited nearly all parts of the earth.

It made the winter of 1900–1 memorable in New York City. The public press was full of it. It lends itself easily to sensational and alarming reports. The President and his wife were in its clutches. Business, traffic, theatres, the bench, even the police, were temporarily disabled by it.

The poor congested the hospitals and overflowed into armories and refuge buildings of emergency. Every nostrum factory whose product could be twisted into the semblance of a "grippe cure" was in large type in the advertising pages of the daily papers. There were 14,000 cases in New York City in December, 1900; there were 20,000 in January, 1901. Chicago had 100,000 cases during the season of epidemic in that city. The total of individual suffering was enormous, and an incalculable array of evils was in its train.

Every one ought to know what the grippe is, whether he ever had it or not, and the substance of present medical knowledge regarding it is as follows:

La grippe (spelled *grip* by many) is a pandemic disease appearing at irregular intervals and characterized by extraordinary rapidity of extension and the large number of people attacked. Following the universal appearance there are, as a rule, for several years epidemic outbreaks in different regions. The height of an epidemic in any one locality has usually been from six to eight weeks.

Clinically the disease has protean aspects, but with a special tendency to attack the respiratory mucous membrane. With perhaps one exception there is no disease which attacks indiscirminately so large a proportion of the inhabitants. While the direct rate of mortality is fortunately low, yet the last epidemic taught physicians to recognize in influenza, particularly in its sequels and complications, one of the most serious of all specific diseases.

The epidemics which followed the great pandemic of 1889–90 varied in extent and intensity in different localities. The disease is highly contagious. Outbreaks ignore all seasons and atmospheric conditions, though the worst have occurred in winter. One attack does not protect against another. The associated germ is known as Pfeiffer's bacillus.

The incubation period is from one to four days. The onset is usually abrupt, with fever and systemic disturbances; often with such prostration and pains as to give it at one time in the South the name of break-bone fever. The manifestations of the disease are so extraordinarily complex that they serve to classify the grip into different forms: as, respiratory, nervous, gastro-intestinal, and febrile.

The mucous membrane of the respiratory tract from the nose to the air cells of the lungs may be regarded as the favorite hunting ground of the grippe bacilli. In the simple forms the disease sets in with a cold in the head and presents the features of an acute catarrhal fever with rather more prostration and debility than is usual. In other cases bronchitis develops, the fever continues, there is delirium and much prostration, and the clinical picture may even be that of severe typhoid.

The graver respiratory conditions which develop from the grip are bronchitis, pleurisy, and pneumonia. Influenza pneumonia is one of the most serious effects and much of the mortality of the disease depends upon the fatal character of this formidable complication. Pulmonary tuberculosis is usually much aggravated by an attack of the grip. It often dates from the lesions of an attack. A patient we are treating to-day states that his consumption followed an attack of the grip in the great epidemic of 1900.

In the nervous form, without any feverish symptoms there may be severe headache, pain in the back and joints, with profound prostration. Many remarkable nervous manifestations were noted during the last epidemic of the grip. All forms of neuritis are not uncommon, and almost every form of disease of the nervous system may follow influenza. Depression of spirits is an important sequel (in a number of reported cases, leading to suicide); and to the involvement of the nerves may be ascribed some of the common heart symptoms such as persistent irregularity, tachycardia or bradycardia, and attacks of angina pectoris.

In the gastro-intestinal form of grip the onset of fever may be accompanied by nausea and vomiting; or abdominal pain, profuse diarrhœa and collapse. In some epidemics jaundice has been a common symptom.

In the febrile form the fever (with its great prostration) may be the only marked manifestation of the disease. It is sometimes remittent with chills, and in occasional cases has simulated typhoid for several weeks.

While these are the most common variations of the grip there are many others. Various affections of the kidneys have been noted. The heart is often implicated. Herpes is common. Inflammations of the eye and ear have not infrequently occurred. Since the last epidemics it has been customary to date many ailments or chronic ill-health from an attack of the grip, and in many cases this is correct. Says Osler: "It is astonishing, the number of people who have been crippled in health for years after an attack. The convalescence following this disease requires careful management, and it may be weeks or months, if not one or two years, before the patient is fully restored to health under ordinary treatment. It is the dictum of wise experience that every case of the disease should be regarded as serious and treated accordingly, as in this way alone can serious complications be avoided." This popular writer seems to be almost wholly uninformed on the subject of medical electricity and makes no mention of its decisive benefits in the grippe.

We have here given a straightforward account of the grip as it appears to physicians. Even laymen will recognize three central facts in the account: The disease (the germ of it) invades only soil of *lowered vitality;* it profoundly affects and depresses the *nervous system;* it is exceedingly difficult to write a satisfactory *medical* prescription beyond a mere *palliative.*

These three features of the grip are evidences of the need of electricity in its treatment. The nutritional actions which we can set up in the tissues by the aid of electrical energies build up the protective resistance of the body. The tonic actions upon the nervous system established at the same time remove the depressions and, like a released spring, the toned-up energies rise to overcome the disease in nature's own way.

All of the symptoms for which depressing drug anodynes are commonly given can be relieved to far better advantage by selected dosage, technics, and *know how* in the uses of medical electricity. All the complications can be attacked, abated, and rapidly overcome by the aid of the indicated electrical methods. And with the decisive actions of electric currents to aid the patient there will be no lingering after-effects to create an army of semi-invalids or cripples with heart, lungs, or kidneys never the same again. Recovery from the grippe can be made as quick, complete, and definite as recovery from the simplest cold by just one remedial agent in the resources of medicine, and that agent is electricity.

During the last epidemic of this disease in New York City we tested the action of high-potential currents in every stage of the grippe, and what we here write we set down from *actual experience.* There are those who do not "see how electricity can cure the grippe," but the author has treated many cases with the most complete success and his teachings of how to meet all indications by making selected technics set up the required actions in the tissues are at the command of physicians who desire to follow them. And simply as a matter of proof that it can be done we regard our actual *doing it* as of more weight than the sentimental doubts of those who do not know *how* to do it. The mere attitude of scepticism in these matters is not testimony in law.

The limits of this small book will not permit the clinical records of many cases to illustrate the actions of electricity in the grippe. But we desire to present a few for the enlightening education they afford. As the benefits of similar treatment apply equally to "colds" of the air passages with other characteristics, and as all these respiratory inflammations are closely related to each other in essence, we shall also permit a few cases of different aspects to be cited here for general information on the subject.

Mr. ———: Onset of grippe. December 26, 1900, woke feeling well; at nine o'clock A.M. chilliness began; at four o'clock P.M. came to our office with chills, fever, splitting headache, general bone pains, and extreme prostration, being scarcely able to keep his feet to reach us. Had three previous attacks, each with three days of fever and a week more in bed under the usual medical treatment. Electrical counter-irritation dispersed the spinal chills in a single moment; soon the circulation was equalized and the intense headache entirely removed. The prostration and pains gave place to a sense of comfort. The time given to the entire treatment was twenty minutes. His functional derangements were temporarily restored while under the influence of the high-potential energy, but a single treatment would not hold them at normal without time for the elimination of the toxins of the disease.

He lived an hour out of town and the day was raw. To avoid the great risk of exposure in his condition he was at once placed in bed. At eight P.M. the fever ceased and he perspired, went to sleep and slept comfortably till morning. At 9:30 A.M. a second treatment was given, his state then being much improved. A slight headache and weakness remained. He was sent to bed again and took nourishment. At three o'clock P.M. he had a third and final treatment. Went home and remained in his house the following day as it rained. The next day he went to business with no further remnant of his attack. In the acute onset (as in this case) the decisive factor is the close repetition of a sufficient number of treatments to control the process and hold it in check. The next case illustrates a different phase.

Mrs. ———: January 8, 1901. Began severe attack of grippe two weeks ago in her home forty miles from New York. Was under care of excellent family physician, but he could obtain no action from remedies employed. Had daily chilliness and fever, with gastric symptoms and the usual pains and prostration. She told her physician at last that she felt that if she could only get to us and have a single treatment with electricity it would start the reaction of her system so that she could then recover at home.

She was so weak that he thought she could hardly venture but approved of the idea—and she managed to come.

The case beautifully demonstrated the resourcefulness of an instrument of precision in electro-technics. An instant's stimulus to the carotids in the neck and an opening of the jugular drainage freed the congested "stuffiness" in the head. This was not done by any venesection as some reader may suppose, but by simply making two rapid contractions of the muscles over the artery and vein and thereby causing a wave of contraction to extend along the walls of these great vessels supplying the cranium with blood and taking the return circulation to the heart.

By another method of administration the residue of frontal headache was next removed. A swift counter-irritant action on the spinal centres removed the chilliness. An electrically generated ozone spray cleared out the nasal congestion. A few tonic contractions of the general muscles put back some of the strength that had been lost. Then, after ten minutes of adjusting the electrical means to ends, she was relieved of symptoms and quite comfortable. Her mouth which had been extremely parched and dry for two weeks was moist again, and she recovered the sense of taste which had been lost. (Electrical action upon the salivary glands always quickly moistens a parched and dry throat—one of the commonest things met in the treatment of respiratory conditions.)

For sustaining action upon the nervous system her treatment was ended with fifteen minutes of an interrupted high-potential charge, a most tranquillizing tonic to an exhausted nervous system and heart. She went home with far more strength than she had when she made the morning journey and rapidly recovered her full health. She called to report the result on January 21.

Miss R———: Grippe. Jan. 11, 1901. Usual condition. Electrical treatment abated all symptoms and left her comfortable. She made a rapid recovery without further treatment. In all cases it is advisable to repeat treatment several times, not only to insure the quickest recovery from the immediate attack but to eliminate any possible after-effects and to reduce the liability of a recurrence to a minimum. These two cases are cited merely to illustrate what has been accomplished in emergencies by a single thorough administration of this physiological and tonic remedy.

Mr. ———: Jan. 14, 1901. Attacked with grippe two days ago. Barely able to get out of bed to come for treatment. Depletion of the cerebral congestion through the jugulars eased the severe headache in thirty seconds. His other symptomatic disturbances were removed by indicated technics and he went home comfortable, refreshed and astonished at his treatment. He remained in-doors until the second day and then came for another treatment. Two days later he called for his third and last treatment, feeling almost in his normal health. When all else of the grippe is removed but the debility the tonic energies of electrical contractions of the muscle fibres restores the strength as an ocean breeze in August revives us from the heat of work.

Pneumonia was a frequent complication of the grippe, as we have mentioned before. Its severity can be modified by a prompt attack upon the initial congestion. Mrs. L———: Feb. 16, 1900, had severe chill, followed by rising temperature, pain in the chest, prostration, anxiety, and all the marked indications of an onset of pneumonia. As she had been under electrical treatment for a chronic uterine condition she hastened for relief of this new attack. Sharp electrical counter-irritation brought the blood to the external capillaries and relieved the pulmonary congestion in part. Another technique removed the pains. With freer heart action and a toned-up nervous system her temperature fell to normal, her sense of prostration lessened, and in about twenty minutes she expressed a general sense of well-being.

These effects, of course, do not last permanently after one treatment in an acute febrile attack, for the process checked by the current soon resumes activity after the current stops. But the later return of the symptoms is almost always less severe and the disease is favorably modified—more and more as successive treatments follow each other.

Owing to the gravity of her condition Mrs. L——— was not allowed to go home but rested on a couch and two hours later was given a second treatment. After this her relief was so marked that she was allowed to leave with advice to go at once to bed and send for a family physician. One week from this date she came again and reported that on reaching home she had gone to bed as directed, but as she had only a mild febrile sequel had seemed to require no medical attention and had risen two and a half days later practically recovered. A tonic treatment restored her energies still further and on her next visit she was prepared to go on with the interrupted treatment of her uterus.

The mortality from pneumonia is from twenty to twenty-five per cent. In the United States there are more than half a million cases every year. Among these are striking numbers of citizens prominent in public affairs, exposure to cold at some public event being followed by a neglected "cold," and then pneumonia. August Belmont the elder caught his fatal cold at the horse show. In December, 1900, Philip D. Armour in Chicago played a game of snowball with his grandchildren. "Guess that's enough, boys," he said by and by, "I'm cold. We'd better go in the house." The press report of the time reads: "Since that day Mr. Armour has been shut up in his house under the care of a physician and a trained nurse. He has been suffering from a severe attack of bronchitis which at times threatens to develop into pneumonia, but at last accounts he was recovering." In a few days more he was dead.

The efficiency of high-potential electrical stimulation of the circulation in removing a state of chill and equalizing the body heat makes its various resources the decisive safeguard of persons so exposed. Employed with promptness on the first sign of injury from cold, electricity can be made as nearly a certain insurance against such terminations as those of Belmont and Armour as anything in medicine can be made certain. With an educated public knowledge of the simple means of protection the neglect of them under such circumstances would have to be regarded as contributory suicide. The physician first called in should, if he is not too late, remedy the neglect at once.

Miss H———. Reached our office after a ten-mile journey in one of the worst snow and wind storms of the winter. She was chilled with the exposure and "frozen to the very marrow," as she expressed it. In such a case the person who simply warms up in a warm room, or takes an alcoholic stimulant, feels the cold worse than before on going out into it again. But there are swift ways to apply an electric current so as to not only give immediate warmth to the system from within, but to impart an increased resistance of the tissues to the next exposure. No other means of urging the deep warm blood of internal vessels through the surface circulation can compare with the energy of a high-potential current or radiant heat.

It not only restores comfortable warmth in place of a shivering chill but it fortifies the system against the same cold that produced the chill. A young man thus warmed on the same cold day referred to above remarked, "that is better than an overcoat. I would rather face a snow storm after such an electrical treatment than with an extra coat." And as he had been attending for treatment to an injured arm during the worst of the winter he spoke from ample experience.

Now let us see what electrical technics can be made to do in cases of bronchitis.

Mr. T——— had suffered from subacute bronchitis for three weeks without improving much. Chest very sore; cough exhaustive; respiration very painful; is obliged to continue at business but scarcely able to keep up. With thorough electrical counter-irritation to the tissues of the thorax, some energizing contractions of the muscles of respiration, and a sedative-tonic application to the throat (all requiring fifteen minutes' time) he was able to go home free from soreness in the chest, a great abatement of the cough, and decided increase in muscular comfort and sense of energy. Later he reported that he had expected to come for more treatments but got well so fast from the first application that none other seemed necessary.

Mr. E———. Acute bronchitis in a case of "winter cough." Had the usual symptoms in a severe form and could hardly get out for treatment. Technics directed to meet the indications removed the congestion, pain, soreness, difficulty in breathing, headache, prostration, etc., and restored a state of physical comfort for the time being. He was advised to go home and go to bed. He did so for the one afternoon, but went to business the next day despite the fact that it rained and exposure was imprudent. He had been taking a medical prescription for two weeks without visible improvement. Electricity established convalescence and he had no further application. Three months later he had passed the winter without relapse.

These cases are not cited here to make any claim that one treatment of bronchitis will cure it. Our reason is far different and is to make plain the real way in which these recoveries take place. They are not the immediate effect of the single application of an electric current. The marked alteration made at once in the state of the patient does not last. In a few hours the maximum of relief passes and the condition falls back so that the symptoms may seem almost as bad as before—but usually not quite so bad.

The great thing that has been accomplished, however, is the *energizing* of the processes of nature, rousing them so that they now take up the task of restoring the normal state. This nature does *gradually.* It takes her some time. She does not correct the congestion and inflammation as water puts out a fire. But the tissues heal in their own way and the patient gets the benefit. The part played by well-directed electricity is that of a lever that lifts up the fallen fôrces of nature and helps them keep their feet till they regain their own normal strength.

Now some of these things take time. The one treatment may be compared to an application of glue to a broken stick. The stick is glued at once but not at once permanently mended. Take it up while the glue is soft and it falls apart. It must be allowed time for the glue to harden, and equally so many of the *mending actions* of electricity in the tissues must be given time to complete the healing. Many cases must be treated a number of times before the mending will be accomplished. There are chronic cases that must be *mended* at intervals for a year or even several years, for conditions that are incurable can only be repaired in part and must be content with the best results that electricity can give when drugs can give no benefit at all.

We have seen that electric currents in appropriate dosage can be made to successfully treat all forms of respiratory inflammations that are amenable to any treatment. Yet the majority of physicians do not know this. Probably 5,000 know it. The knowledge spreads slowly. We can easily recall the day the knowledge first came to us—not from reading or hearsay but from personal experience.

It was in 1893 when the grip was prevalent as it had been since 1889. Till then the author had escaped it. Our colleague was first attacked and we prescribed the usual medicine remedies, not knowing that we had better at hand. A few days later our own turn came. The severity of our head pains led us to apply a high-potential current for the relief of the pain alone. We expected nothing else from it. To our surprise the active process of the grippe was materially abated, and by repeating the electrical technic three times a day we not only maintained a gratifying degree of comfort, but wholly recovered in two more days without any medicine at all.

Since then electricity, and with the better instruction of experience in its actions and technics, has served us in many cases, so that exclusively drug treatment of the grip and chronic bronchitis now seems as inferior to us as the operative methods of fifty years ago seem to the surgeon of to-day. But from 1893 to 1898 we thought it almost absolutely necessary for the patient to remain indoors in order to secure these results, especially in bad weather. How we learned to the contrary happened thus:

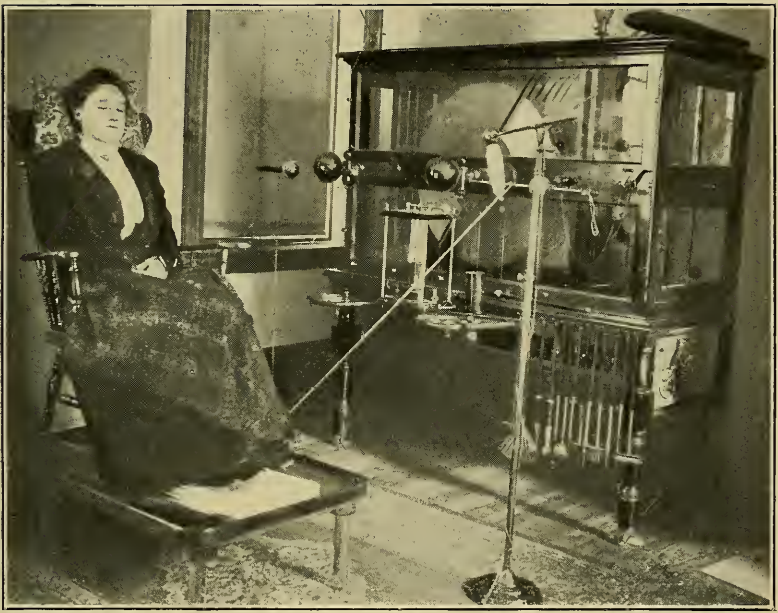
Mr. E———, a stout man aged 46, had acute bronchitis commencing Sept. 13, 1898. Was in bed two weeks, but before full recovery went to business against the advice of his physician. Under daily treatment and daily exposure—for he thought he had to go to business—the bronchitis continued for three months, with various exacerbations. In December the weather was bad. In January, 1899, it was worse. His large business interests weighed upon his mind and he refused to stay home and "take care of himself." On January 21st, his family physician predicted pneumonia unless he went to bed and refused further responsibility in the case. Obstinate as a mule he refused to go to bed and his physician quit.

On the evening of the same day his anxious wife brought him to our office, growling all the way that "electricity could do him no good and it was foolish to make him come. Did not believe in electricity any way." On examination his condition was as follows:

Age 46, looks 55; severe bilateral bronchitis; irritative cough, with great soreness in chest. Cough keeps him awake; has long-lasting paroxysms of uncontrollable and exhaustive severity. Has chronic dyspepsia and functional heart disease. Extreme prostration. "Must go to his office every day."

Once or twice each day has a peculiar attack of faintness with nausea, followed by a dripping perspiration rendering him liable to aggravations of his bronchitis. Also has rheumatism in both arms. While attempting to give me this account of his case he was seized with a violent cough, reeled in his chair, complained of faintness, nausea and sharp pain in the region of the heart—and in this rather discouraging state of almost collapse we helped him to the chair on our static platform for electric treatment.

It required five minutes of careful work to control the heart, remove its pain, quiet the worst of the cough, ease the soreness in the chest, and steady his mental agitation. Ten minutes more



A GENERAL ELECTRIFICATION BY AN INTERRUPTED CHARGE

During this powerful tonic administration the patient often falls asleep and awakes refreshed and rested. The entire system of treatment, of which this is merely one technic, was originated and published by the author in 1893. Others have popularized it under the name "wave current."

had him rallied into a fairly comfortable state, free from perspiration, pain and nervousness; and so much better in his feelings that he was surprised.

As the next day was Sunday he agreed to stay in bed till Monday morning. He was told that he was a very sick man and that if he went to business in the almost blizzard weather it was his own risk and practically suicide. Finally, he agreed to take all other possible precautions and come to me daily for treatment, and if he escaped pneumonia for one week it seemed likely that he would recover. He arranged to stop on his way home about five o'clock P.M., obtain treatment and then go to bed as soon as he reached his house.

Monday P.M., Jan. 23. Reports: in bed all day Sunday as promised; felt easier; had less cough; slept fairly. Felt very bad to-day; very weak; perspire so easily; very nervous. He came in feeling very bad. Went out after treatment feeling "well."

Jan. 24. Called, feeling "much better," although was out in rain and fog. After last treatment went home feeling much better and had a restful sleep till four o'clock in the morning without any cough. Then woke and had spasm of coughing.

Jan. 26. Reports cough looser; slept well; did not get "weak" to-day until afternoon. Says he is much improved, is far less nervous, and is much better in every way.

Jan. 27. Reports: "could breathe deeper to-day; felt good all the morning; got weak in the afternoon and sweat; cough getting looser and less." Râles reduced now to mere remnant. Owing to snow storm and the follow of exposure while he was improving so well he consented to go home and remain in bed until Monday A.M.

Feb. 1. Reported: "Very weak; renewed gastric disturbance and flatulence." Treatment relieved as usual and he left feeling comfortable.

Feb. 2. Came in pleased, to report: "best day yet; no sweat attack or weakness; very little cough; chest no longer sore at all." Sleeps well and heart worries him less. Gave him a special tonic application of electrical energy after his regular treatment as he was exceedingly anxious to take his wife to "the great Ball of the year" this evening. This indicates his progress in a little short of two weeks, with such an illness, in such weather, with static electricity.

Feb. 3. Called as usual on way home. Reports: "Was at Ball, and up till two o'clock A.M. Rose at seven A.M., and have felt better and stronger to-day than any day since I was sick. Almost no sweat or cough." Is much stronger.

Feb. 4. Is immensely improved. Lungs nearly clear of râles. Little expectoration left. Heart quiet and stronger. Little cough. Mind cheerful and he now realizes his escape.

Feb. 6. Tenth treatment. Reports himself feeling a great deal better.

Feb. 7. "Am doing better every day."

Feb. 8. Twelfth treatment. Feels nearly as well as usual. Must now take a business trip of two or three weeks, to Cleveland and the West. Will report on return and resume treatment to insure complete recovery.

Those who recall the character of winter weather when Mr. E——— was daily journeying back and forth from business; its intense cold, snow, and high winds, coming after a period of rain and change, will appreciate the work done on this case. Three weeks later he returned from his Western trip, had three further treatments, concluded that he was in need of no more and quit. He continued to gain in general health and a year later his wife told us that he was very well indeed.

Following this experience we have many times been impressed with the fact that the actions of electricity can be made so decisive as to outweigh the risks of temporary exposure. The following cases illustrate other points of interest to patients.

Miss C———. Has acute cold in the head—coryza—with severe congestive headache in frontal region. As this one case is typical of many we may here inform readers who are not physicians that the main blood supply of the head is carried upward from the heart through the carotid arteries, which divide in the neck near the upper border of the thyroid cartilage (Adam's Apple) and send branches to face, nose, eye, mouth, tongue, ear, forehead, anterior portion of brain, etc. The return drainage back to the heart is accomplished through the jugular veins which collect the blood when it has given up its oxygen to the cranial tissues, and in passing down the neck the great vein lies very close to the artery on each side.

In coryza we have a partial stasis of the circulation in the mucous lining membrane and delicate tissues of the nose, eyes, frontal sinus, and adjoining parts. To relieve this congestion, which causes pain and pressure-distress, and which is an important element of the "cold," we must drive the arterial blood more freely through the capillaries, and we must give the return venous circulation a better drainage.

A swift electrical impulse to the muscular walls of the carotid arteries (one on each side of the neck) flushes the fresh supply of blood through the impeded capillaries; while a tap on the great jugular veins opens their free drainage and the vascular stagnation gives place to an active flow. This removes the congestion. The time required is usually but a few seconds.

To complete the process of relief we must next set up a sedative action on the mucous membrane of the nose, eyes, and frontal sinus (situated behind the forehead) to remove the ache, dulness, and irritation. This requires from five to ten minutes ordinarily, with an efficient current and technic.

To demonstrate these actions to a visiting physician we requested Miss C——— to speak the instant she felt the congestion in the head begin to abate from the application to the carotids and jugulars in the neck. In ten seconds she said the head already felt easier. When the remainder of the treatment was entirely finished she remarked, "My head now feels as if it had been washed out with an antiseptic solution"; but "solutions" touch only the surface, while an electric current penetrates with a much deeper action and more lasting good effects.

Another illustrative case was that of a young lady who was continually "catching cold." She abused her health in the manner of many heedless girls who are superior to advice or experience. At her first treatment the jugular depletion of the congestion began her relief and after treatment she left in a state of comfort. But a few days later she returned with an aggravation extending to the larynx. For a full half-hour she had been coughing uncontrollably and was red in the face and tired from the strain. The spasm ceased as soon as the sedative current reached the irritated tissues, as a breath blows out the flame of a match.

By a persistent application of the same treatment for ten minutes she was so much improved that the throat gave no more trouble and in a few days was well. Two additional treatments cleared up the lingering coryza of this attack, but nothing will "cure" the young woman of habitual imprudences. Electricity has no curative effect on folly. Those who expose themselves recklessly will not stay well till their habits change.

The difference between the results of immediate treatment of a coryza and the same treatment when the case has been allowed to become chronic is shown in the next two cases in the same family. Mrs. ——— had caught cold the day previous. She had been under treatment for chronic gastralgia and came at once to see if electricity would help her cold. Some time later her husband called and said his wife had sent him to have us "break up his cold with electricity." He said it had ended her cold with one treatment and he hoped it would do the same for his. On inquiry it appeared that he had had his coryza for three weeks and generally had more or less "snuffles" all winter. It took two weeks (six treatments) to restore his condition to normal.

There is a general rule in medicine that the longer a disease has existed the longer it is likely to take to cure it. This is quite apart from the severity of the disease and is due to the fact that when tissue-changes have lasted a long time it is harder to get them back into the normal state again. Therefore, the sooner treatment is obtained for either colds or any other disease the sooner the patient is likely to recover—if the condition is curable by treatment.

We will next explain the nature and curability of *hay fever* and then take up the great question of tuberculosis, describing exactly what consumption is, and the rational manner in which it can be cured and stamped out until it becomes as scarce as smallpox.

# CHAPTER XXVI.

## THE CURATIVE TREATMENT OF HAY FEVER.

Showing how an Understanding of the Character of this Disease Makes Clear the Rational Principles of Treatment, and Indicates the Need of the Healing and Tonic Actions of Electric Currents. Curable at all Seasons. Treatment in Winter or Early Spring Permanently Prevents Attacks.

The general public has far too long been misled by the tradition that hay fever is incurable, for *few diseases are more easily remedied.* The opinion voiced by Henry Ward Beecher that the "only cure for this affection is six feet of earth" was good thirty years ago, but to-day is in grotesque contrast with the facts respecting its simple treatment and relief, yet the obsolete tradition lingers on the stage.

We shall endeavor to make the nature of this disease so plainly understood by readers that the correct principles of treatment will be recognized by every one. Hay feverites should cease to think it a whimsical eccentricity (outside the rules of remedial action), and learn that it is subject to the same laws that govern other diseases. Now let us understand what hay fever is.

For the production of an attack of hay fever we must first have a patient who is *neurotic*—whose nervous system is habitually below *par* and lacks the soundness of tissue-resistance which belongs to normal health. The ordinary person may not realize that he or she is "neurotic," but the state is generally recognized by physicians. In other respects the person may be well enough to consider herself quite well. The reason why this condition of lessened nerve-resistance to *irritation* is essential to the production of hay fever is the fact that the attack of hay fever is produced by an *irritant* acting on terminal nerve bulbs in the mucous membrane of the nose. (Read Chapter XXV.)

But out of several million of people who are of the neurotic diathesis only a couple of hundred thousand have hay fever. The reason of this is the *second* necessary element in the production of the attack,—a vasomotor *paralysis* and dilated condition of the fine blood-vessels in diseased mucous tissues of the nasal chambers.

Now, very few people have a perfectly normal nose all their life, and those whose nasal chambers are diseased number millions, yet irritating substances in the atmosphere are inhaled by most of them without causing hay fever. There must be *three* conditions all present in the one individual at the same time in order to make the acute attack possible, and these are:

1. A state of lessened resistance in the nervous system—a degree of *neurasthenia* in which the normal nerve tone is below par.

2. A diseased condition of the nasal chambers—a dilatation (a vasomotor *paralysis*) of the capillary blood-vessels, with reflex irritability of the terminal nerve bulbs ending in these congested tissues of the nose.

3. Some irritating substance carried as a dust in the atmosphere, which may be the pollen of plants or a dozen other things.

If the two contributing factors in the individual are removed by treatment it is clear that the third factor—the dust irritant—will no longer produce hay fever; that is, the patient will be *cured.* The question is, "Can the two predisposing factors be removed?" They can, and at any time of the year.

If the reader will turn to our chapter on functional nervous diseases, and also peruse our accounts of the physiological actions of the various electric currents, this question will seem so plainly answered that the helpless feeling of hay-feverites is more a fashion than a necessity. It reminds us of the man who fell over a cliff in the dark and saved his life by grasping the branch of a tree. Being sure that a thousand feet of chasm yawned below him he held on to the branch all night. It was hard work, but there was no cure for it. To let go meant instant death to him. In the morning he looked down and saw that solid earth was only a few inches below his feet. A remedy for hay fever is similarly near at hand.

It will be instructive to now consider treatment by *drugs* before speaking of electricity, so that we can compare the actions and results of the two. A long list of drugs has been prescribed for hay fever, both locally and internally, and when we scan the names of those most used in the past—opium, cocaine, arsenic, iodide, digitalis, belladonna, quinine, zinc, the phosphates, valerian, hyoscyamus, bromides, menthol, etc.,—it is evident that much use of some of them would be worse than the disease; that none of them could possibly be curative; and that all of them were mere empirical guesswork in unscientific prescribing.

In 1896 the extract of Suprarenal capsule was put forward as the remedy *par excellence* among drugs. The manufacturer of the new remedy sent out a circular with it—a circular to physicians—in which it was at once stated that *not a cure* but only temporary relief was afforded. We quote as follows:

> "Extensive experiments made during the past few years prove that Extract of Suprarenal capsules is the most satisfactory remedy for hay fever. It is employed locally and internally. For internal use it should be given every two hours until giddiness or palpitation appears, or until the nasal mucous membrane shows that the vasomotor paralysis is under control. Then increase the time between doses to three hours; then to six; then give only twice a day; continuing in this way during the hay-fever season.
>
> "Physicians should bear in mind that Suprarenal Extract can be depended on only for temporary relief, and that it should be given every year during the season when the patient is subject to hay fever."

Nose specialists accustomed to former remedies were "unable to speak over-enthusiastically of the benefit and effect of this remedy," for a candle-light appears brilliant to one who has lived in the dark. We quote from a report by a Professor of Diseases of the Nose in one of our medical schools:

> "In some way it marvellously controls the vasomotor vessels of the nose. There is a marked reduction in the size of the turbinate bodies, with a lessening of irritation and almost complete cessation of coryza and sneezing. An improvement in the conjunctival condition can be observed in less than forty-eight (sometimes in twenty-four) hours, and under its continued administration the patient remains in comparative comfort during the remainder of the attack.
>
> "Its effects, locally, are not so harmful as are those of cocaine. It has no dangerous sequelæ, yet when full doses have been given the patient experiences a certain degree of vertigo (dizziness), some nervous excitement, and always an increase in the frequency of the heart's action. I can conceive that its long local use may so diminish the normal blood supply as to cause atrophy.
>
> "With this single danger suprarenal gland is easily the leader of all remedies in the treatment of hay fever."

A physician pleased with such a remedy is easily satisfied, for:

1. The drug is a temporary palliative and not a cure.
2. In some cases it requires one or two full days to obtain relief, and it is not a physiological action when obtained.
3. Full doses have disturbing effects on the heart and nervous system.

This remedy, so far from curative and so full of drawbacks, held the field until the appearance of an antitoxin serum, also a palliative and not a cure. The routine attitude of the medical profession toward these remedies—giving them hearty welcome and applause—is a striking comment on the want of thoroughness in the drug treatment of hay fever.

Reports of the new antitoxin show that it has no curative action, it being a variable agent, "immunizing" some cases if used just before the onset of the expected attack, only partially relieving other patients, and still less successful if not employed until the attack is well established, and failing entirely in some forms of hay fever. The antitoxin method does not advance in scope of action beyond other drugs and has its own limitations and drawbacks. It is with gratification that we now turn to the deeper and more curative actions of electricity—the only means known to medicine of restoring normal tone to the nervous system and of healing the local lesion in the nose.

In order to make extremely plain what simple therapeutic actions are required to "cure hay fever" we note first that the primary element on which the disease is planted—the neurotic state of lessened nerve resistance to external irritants—is a purely *functional* matter. The significance of the clinical fact that the suffering and annoyance of hay fever are of *functional* origin cannot be too strongly stated, for the regulation of disordered functions to more normal actions is one of *the great physiological properties of high-potential electricity.*

So soon as we know that any given disease is functional and not organic we know that we have a possible remedy among the resources of electrical currents, and it only remains to discover the efficient method of making the selected current set up the necessary action within the tissues in order to regulate the controlling nerve supply and produce a cure. A study of actions that electricity can be made to excite in the tissues shows that we can make it do vastly more than is necessary to correct the functional nervous diathesis underlying hay-fever attacks. For proof of this see chapters three to seven, inclusive.

Next, the most apparent and constant clinical lesion of hay fever in the nose is a nasal vasomotor paralysis. For a hundred years the world has known that the only competent means of overcoming paralysis anywhere in the body is the stimulus of electricity.

Along with this local loss of the contractile function of the elastic muscle fibres in the walls of the small blood-vessels (which electricity can be made to restore) goes a congestion and œdema, producing certain symptoms which are *never* more than the symptoms of a severe acute inflammation of the respiratory mucous membrane. To allay these distinctive symptoms requires a sedative action upon the irritated tissues, and electrical sedation is efficient.

The sneezing, coughing, burning pain in the nose, the flowing of a considerable quantity of serous discharge, the extension of the disease into the larynx and finally into the bronchial tubes, the irritation and discomfort which the patient suffers—all these spring from the single functional derangement which electricity can be made to correct.

The fact that the same nose may contain a deflected septum, or an exostosis, or hypertrophied turbinates, or polypi, does not alter the principles here laid down. Whatever additional work may be required to improve the capacity of the nose should be done, but the curative treatment of hay fever is not dependent on doing all the surgical work that a given nose can possibly stand. The local lesion is a lesion of the mucous membrane and its curative treatment is exclusive of any operation whatever, provided that the nasal passage is permeable to air.

With a knowledge of how to make electricity set up the necessary healing and soothing actions in the mucous tissues we seat the patient in a comfortable chair, adjust the required dose, and employ the correct technics originated by the author ten or more years ago. This done, the burning pain in the nose begins to abate at once; the headache lessens; the excessive secretion diminishes; the vasomotor disturbance subsides; the vascular walls contract; and by the time the treatment has lasted about five minutes the patient breathes with a natural comfort and none of the drawbacks that attend the uses of hay-fever drugs. It is not the calm of a narcotic but the restoration of physiological functions.

This regulation of the functions of the tissues to the actions of health lasts only a little while after the first treatment. But the return of the symptoms is less severe. The second application carries the healing process forward a little further and relief lasts longer. The secretion abates to a small fraction of its previous amount and the comfort attained thus early is incomparably beyond the effects of drugs. Treatment is repeated until the nasal irritation subsides, and while fluctuations occur in the condition on different days, yet the process does not very much relapse but goes on to a gradual cure.

Along with the local treatment is carried on the necessary treatment of the general nervous system, so that when the patient is free from the functional derangement that permits the nasal irritation to set up the hay-fever attack she will *thereafter remain well.* This means that a radical cure is accomplished which will last the patient as long as the ordinary cure of any other functional disease—for a few years or for life, according to whether circumstances favor a relapse or not.

That climate has no curative action upon hay fever is too well known to call for mention here. Drugs have no curative action. The only means of a physiological restoration of the normal functions lies in the resources of the so-called physical agencies, and the particular agent is one of the high-potential electric currents. For many years efforts were made to set up the required actions of healing with faradic and galvanic apparatus but without avail, for the tools were inefficient. In 1888 Hutchinson benefited some cases but cured none. The author appears to have been the first to work out the decisive method of treatment.

Practically every patient having hay fever at any time of year and of any variety and of all varieties, regardless of any discrimination whatever, can be *improved.* The majority of them can be restored to about the same condition of freedom from hay fever as the ordinary individual. It cannot be possible to so immunize the nose that it will never again catch another "cold," but it will do so only as the ordinary person catches cold and not develop hay fever. The permanency of the radical cure will be governed somewhat by the persistence with which the patient follows up sufficient treatment—for while a very few treatments may correct a single attack it may require twenty or more treatments to properly tone up the general vitality of the half shattered nerves of an invalid housewife who is so irritated by family cares that she dreads to go home if she gets away. A reasonable allowance for the state of the general health must be made. But with such an allowance electricity will seldom disappoint the patient.

*One other feature in the electrical treatment of hay-fever deserves mention: the patient need not wait until the season of attack in order to be properly treated. Far better be treated long before the attack begins. For the curative action upon the general nervous system and the local nasal lesion is independent of season and removes the two primary conditions as well at one time of year as at another. Preferably, the best treatment is given during the winter.*

The person who has been subject to hay fever has been accustomed to await the approach of the expected attack, and then, if means permitted, go to some other locality in which they get through the period with the disease. This may not inconvenience some, but for others it involves a sacrifice, and for all it is unnecessary and without real benefit. Another course may be pursued to far better advantage.

At any other time of year, when it is most convenient, the hay-fever victim should be treated for the removal of the two conditions we have described and on which the effect of the inhaled irritant depends. The two conditions—the reduced resistance of the general nervous system and the local lesion in the nose—exist all the year round and can be successfully treated in the winter, spring, or autumn, even better than in the heat of the summer. If these conditions are corrected before the hay-fever season the attack will not develop, for healthy tissues are not irritated by the pollen of plants or any dust or odors in the atmosphere. This restorative treatment is the prophylaxis and the cure.

If the patient waits until the attack commences the treatment is exactly the same. There is no difference in the principle of curative treatment, whether administered at one time or another. But if all wait till the nose runs before seeking relief the best results will not be obtained in all cases, for the tendency of the patient will then be to concentrate attention upon the local lesion and ignore the underlying neurosis. Nasal secretion can be speedily regulated by electricity, but the permanent basis of sound nerves cannot be given the neurasthenic quite so quickly; and when the "run-down" state exists in a marked degree the upbuilding process must necessarily take still longer.

All persons subject to frequent attacks of cold in the head are in the same class as those who have the type of coryza known as hay fever. A tendency to have a running nose with every spell of raw winter or spring weather is the badge and sign manual of a lessened tissue-resistance, and for this state the same treatment is curative in the same manner. It is precisely the same principle as applies to the curative treatment of chronic bronchitis, the grippe, and nasal catarrh. The general information on these subjects given in this book will be useful to all readers with hay fever, or any semblance of it. The chapter on functional diseases of the nervous system should also be read.

The limitations placed on the size of this book by the publishers will not permit us to give the details of many clinical cases, but those that follow will illustrate the effects of treatment. They are copied from our records of the dates given.

Mrs. S———. Aged 46; has suffered from annual attacks of hay fever for nine years. Is now in middle of present attack. First saw her on Sept. 22, 1898. Has coryza and irritative cough, with laryngeal and bronchial extension; very hoarse and has partial loss of voice; considerable soreness in chest; uses ten handkerchiefs in a morning; has had a great deal of medical treatment without benefit. Has a rheumatic diathesis and gastro-intestinal complications.

The irritation was almost entirely removed in ten minutes at her first treatment with electricity. Next day she reported that she "had the best and most comfortable night she had ever known during an attack and had used only two handkerchiefs this morning." Cough was less and voice much improved.

Sept. 24. "Great comfort at night; nose much less congested"; voice about normal; used three handkerchiefs the entire day." The three days past have been rainy, raw weather, very bad for her to be out in, yet the effects of treatment have been gratifying, despite exposure.

Sept. 26. Still rains and this aggravates her condition but has had great relief most of the time and has used only two handkerchiefs in the last twenty-four hours. Each treatment removes all irritation and she goes home comfortable and feels a still greater sense of benefit an hour or two later. Is obliged to be out (on business) despite bad weather and is therefore exposed to aggravations.

Sept. 28. Called for fifth treatment. Good report; has required but one handkerchief per day for last two days and nose is now as dry as normal. Cough has temporary aggravations when it reappears but gives little trouble. Chest was sore to-day. Treatment gave entire relief. "The character of this relief is like a new lease of natural health and vigor." No drugs produce a similar quality of comfort in the abatement of an irritable coryza, and the general health is toned up at the same time.

Sept. 30. Weather now humid and very warm for the season. Is now nearly well, though previous attacks have always lasted until frost.

Oct. 3. Reports: Eyes, nose, and throat entirely well; slight bronchial irritation remains and varies with the weather. Treated same.

Oct. 5. Called and reported free from any further symptoms.

Oct. 7. Reports: exposed in severe rain and caught a fresh cold. Very slight evidence of coryza, which treatment removed. On the 10th, she again reported a bronchial aggravation, the weather now being raw and her occupation calling her out daily in all weathers.

Oct. 17. Called with good report and not for treatment. Has had no return of hay-fever symptoms since they disappeared. She remained free from hay fever during the following season. Five years later she wrote the author a report in which she stated that she had remained free since her treatment in 1898. This lady had prematurely gray hair and she noted that as her nutrition improved during the course of treatment her hair darkened several shades.

An example of an ordinary case of hay fever without asthmatic complications was as follows:

Mr. L———. Subject to hay fever for ten seasons. "Eyes and nose burn like fire." First came to us for treatment, June 30, 1900, when his attack had been established about a week. His annual attacks come on early and last until fall. Using now sixteen handkerchiefs a day. Had "tried everything," and thought there was no means of relief to be had.

In about five minutes from the commencement of treatment his eyes and nose were free from irritation and the excessive secretion was dried to normal. He was greatly amazed at the action of electricity, as are people in general who have only been familiar with a faradic toy battery. This immediate effect of entire relief does not remain permanent, else no one would need more than one administration, but the final result of sufficient treatment is permanent.

July 3. Mr. L——— reported that he had held fifty per cent of his gain from first treatment. Sneezing entirely stopped; discharge greatly reduced.

July 7. Called for third treatment. Uses only one handkerchief per day now. Has but a slight remnant of the irritation left. It is now severe hot weather—a very hot wave for New York—and he has always been worse at such times.

July 14. Reported that "he needed no further treatment. The hay fever had simply disappeared and left no trace."

He had no return of symptoms during the remainder of the summer and called on us January 4, 1901, reporting that it was his first release from the disease in ten years. For several years we kept in communication with him and he had no more hay fever.

When hay fever has a pronounced asthmatic complication, or a chronic bronchitis of many years' standing, the results of treatment are more difficult to obtain. There is more work to be done. The diseased condition is more obstinate. The general state of the patient is apt to be more considerably reduced below *par*. As to drugs in these cases, they afford no actions to compare with electricity. Of even suprarenal extract writers remark:

> "It is not so active in the control of asthmatic symptoms. Patients are not helped by it at all when there is a loss of vascular elasticity, or in conditions of the blood-vessels resulting from Bright's disease of the kidneys. Cases with degeneration of the heart muscle are also hopeless of any benefit from this drug."

Although the above classes of cases present greater difficulties in the way of a radically permanent cure, yet long lasting relief can be secured with an electric current, and at the same time a great deal of good can be done the general health of such patients. At all points, the superiority of electricity in the treatment of every phase of hay fever is very great. This brings us to the last and greatest disease of the respiratory organs and we venture to hope that no reader of this book will skip any one of the next four chapters.

# CHAPTER XXVII.

## THE PATHOLOGY OF CONSUMPTION.

A Brief Description of the Modern Understanding of the Nature of This Disease and How Nature Heals it. Showing the Curability of Tuberculosis when Treated before the Lung Cells are Destroyed.

To enable the reader to understand how nature heals up the destroying inflammation of the lungs which is called consumption because it literally *consumes* lung tissue, we must first make clear exactly what kind of a disease tuberculosis is. Scarcely any of the public have any idea of the pathology behind the wasted cheek of the consumptive and we shall try to explain it intelligibly.

The tubercle bacillus (the germ associated with this disease) is usually a short, fine, rod-shaped micro-organism, often bent a little, and has an average length of about half the diameter of a red blood corpuscle. To a well person whose tissues have the normal resisting powers of sound health this germ is usually harmless when inhaled, because it cannot lodge and grow on a mucous membrane unless it finds a foothold in some breach in the tissues made by a previous debility, congestion, or inflammation.

But when inhaled with the dust of the air and lodged in the respiratory tract of an individual with an *impaired* tissue-resistance —tissues soft enough for it to dig into—it patiently and very slowly delves its way into the most delicate structures of the lung cells.

Once established in a favorable position the intruder acts first as an *irritant*, something like an exceedingly small cinder in the eye, or as a small splinter in the finger. As this microscopic irritation increases at the point of lodgment of the bacillus the walls of the surrounding cells infiltrate and thicken in nature's effort to surround and smother the bacillus and destroy it before it destroys the tissues—but it is hard to kill.

From this initial effort of nature a little "granulation" is formed and in the centre of it is the bacillus which will presently be joined by others. As more of them enter the breach in the lung tissue and propagate, additional granulation is developed by nature's attempts to resist them, until finally a whole lobule-unit of the lungs is involved in the contest between the cells of the tissues (fighting for their life) and the germs which are endeavoring to create disease.

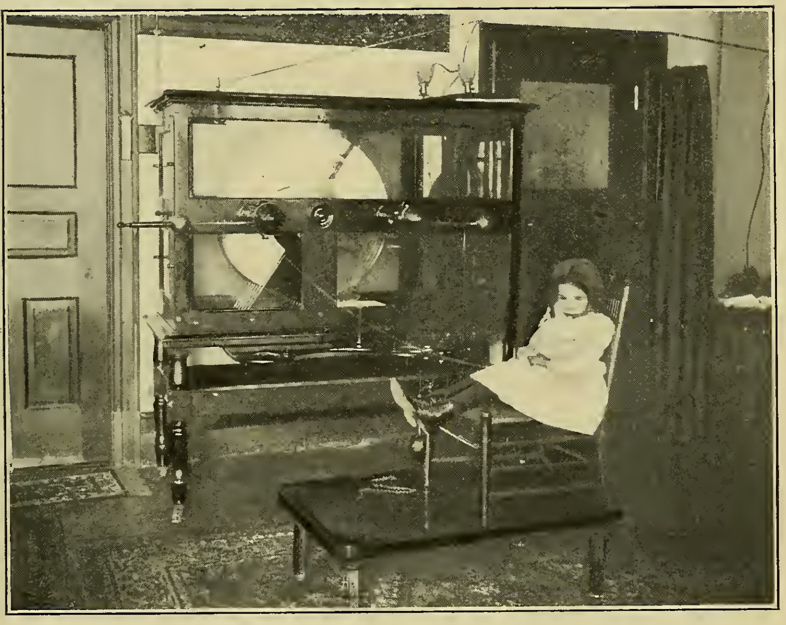
The completion of the primary process in a single unit of pulmonary lobule results in an irregularly rounded or oval body about $\frac{1}{25}$ to $\frac{1}{4}$ of an inch in diameter, and this constitutes the *tubercle* which gives the name of tuberculosis to the disease.

The first tubercle may form in one of the smallest air passages at the apex of one of the lungs—a point apt to be least vigorously inflated in ordinary breathing—and from this starting focus the disease spreads with varying rapidity to other parts. The tubercles plug up the air passages in the area they invade and when a number of them merge into one diseased mass they in time begin a slow process of degeneration during which they gradually break down into cheesy material which is removed by expectoration, and a *cavity* is the hollow from which the caseous material has been "raised" and spit out.

As neither tubercle nor cavity can perform the function of breathing, the amount of air taken into the lungs is reduced more and more as the number of tubercles increase by the spread of inflammation. This causes a gradually increasing oxygen-deficiency—the "shortness of wind" complained of by the patient—and this reduction of oxygen-food causes the peculiar starvation of all the tissues (the anæmia) which is the characteristic of consumption.

Sometimes the process involves the connective tissue rather than the air vesicles, and in this case a modified and slower form of the disease develops which is called "fibroid phthisis."

In the first process of irritation and congestion the cough, if any, is "dry." When the inflammatory process reaches the stage when the tissues pour out an exudate this is at first "tight," then gets "looser" and is coughed up through the bronchial tubes and is known as "sputum." This sputum is at first serous, then mucous, and as septic processes go on it becomes purulent and finally caseous. After the early stage it is more or less filled with bacilli, and when the sputum dries and is scattered in the air as dust and is inhaled it infects other people and thus perpetuates the disease. The tubercle is an internal ulcer, and the sputum



A CHILD OBTAINING COMFORT FROM ELECTRICITY

The child is charged on the insulated static platform. There is no sensation. The youngest baby can be thus given tonic and sedative treatment.

is essentially the same thing as is seen in the pus of an external ulcer. When viscid it is too tenacious to cough up and hence so-called expectorants are given to liquefy it so it can be expectorated.

When the slowly spreading ulcerating process eats its way across the fine blood-vessels it sometimes erodes their walls so that the strain of coughing ruptures them and the blood is discharged as a "hemorrhage." This alarms the patient more than it deserves, for the blood should be got rid of and not retained as a clot in the lungs to clog up the air spaces.

Consumption produces in different persons and at different times a wide variety of symptoms, which are in the main those of a chronic bronchitis to which is added a *septic infection.* Every case of consumption is a *bronchitis*, but when the simple inflammatory process takes on the ulcerative and degenerative character which turns the organ of respiration into a diseased mass of tubercles and cavities the poisoning of the blood and the entire body creates the additional symptoms which are so well known. If we can eliminate the septic absorption from the blood many of these symptoms (as, the hectic fever) subside at once. If we can by some tonic means invigorate the energies of the tissues so that beyond their already invaded area the bacilli can make no further progress we "arrest" the disease and the patient does not die of consumption.

Still further, if the energies of nature prove stronger than the forces of the disease the tissues "cast out" the foreign intruder and the patient gets well—that is, the disease is *cured.* The spontaneous cure of "nature" in the case of the bacillus lodged in the lungs is the same process as that familiar one which all have seen her employ in getting rid of a wooden splinter buried in a finger.

The splinter is a "foreign body" and, as such, must be cast out. The "little soldiers of the blood" rush to surround the irritating object and the cells set up a boundary of "inflammation" which is nature's attack and defence in all intrusions of foreign bodies of whatever kind—splinters, poisons, germs, bullets. When the splinter is surrounded the cells make a line of demarcation; a slough forms; the spot is said to "fester" (suppurate); and finally it separates from the healthy tissues under the slough and is cast off. The tissues then heal and close the surface and the wound is "cured."

If this is done in the lungs the consumption is "cured." When only a small part of otherwise fairly healthy lungs in fairly healthy individuals is infected nature repels the attack and the person gets well. The story of her resources in defence of the tissues is worth reading and is the classical narrative of a fight that never ceases between the cradle and the grave. To tell it adequately would fill this book, but in a few pages we shall try to condense the main facts. The active agent of Nature is the *blood.*

"Spring Medicines" and "blood purifiers" have advertised so many things about the blood that its real physiology is lost sight of in the reader's mind. The scientific facts are, however, more wonderful than the fictions of patent-medicine almanacs. The natural banquet of the tissues for the daily regeneration of their vitality (their working energy) is derived from the oxygen and elements of nutrition borne to them in the arterial circulation of the blood.

In character the normal blood is an opaque, viscid, alkaline, saline, faintly odorous, red fluid. Its quantity equals about one-tenth of the body weight. It is red in the arteries where its red corpuscles are laden with oxygen, and is dark blue in the veins as it has given off its oxygen before it enters them. This difference in color is due to oxygen alone.

In order to be the great nourisher of the body and carry oxygen to all the tissues the blood is especially constituted of certain anatomical elements, of which the chief are:

1. The "plasma," which is a clear liquid (serum), forming half the total blood.

2. The red corpuscles, which are organic, nitrogenized, flattened, biconcave, circular discs of amber color and $\frac{1}{3437}$ of an inch in diameter. They are homogeneous (without nucleus) and float in the plasma, carrying oxygen for which they possess a remarkable affinity.

3. White corpuscles, which are larger than the red, are globular, granular, nucleated bodies, existing in lymph, chyle, pus, and blood alike. They number but one to every 750 or 1,000 of the red corpuscles. They are gifted with the power of "amœboid" movement by means of which they are able to form a line of defence —the line of an acute localized inflammation—when an enemy attacks a part, for they are the active soldiers of "Nature's Home Guard" in the tissues.

The color of arterial blood is caused by hæmoglobin in the red corpuscles. Its opacity is due to the different refractive powers of the plasma and the corpuscles. Its salinity results from sodium chloride (common salt) in the plasma. Sodium phosphate and carbonate in the plasma create the alkalinity, and its stickiness springs from the albuminoids of the corpuscles.

The corpuscles contain hæmoglobin, globulin, inorganic salts (especially potassium salts), iron, and also cholesterin, lecithin, and fatty matter. Most abundant in the corpuscles are the phosphorized fats and potassium salts, while chiefly found in the plasma are the fatty acids and sodium salts.

Hæmoglobin equals $\frac{9}{10}$ of the total substance of dry corpuscles, and is distinguished by its strong affinity for oxygen, the essential vitalizing gas of air and water. Red blood corpuscles are able to absorb from ten to thirteen times as much oxygen as an equal bulk of water ($H_2O$), and are the most important part of the blood. The albuminoid constituents of the plasma furnish to the tissues through which they circulate the nutrition derived from digested food. These nutritious constituents are classified by chemists as follows:

1. Inorganic constituents: water and salts.
2. Organic saline constituents.
3. Organic non-nitrogenized constituents: sugars, starches, and fats.
4. Organic nitrogenized constituents: albuminoids.

To preserve the balance of health our foods must supply the proper balance of these nutritious elements for the repair of the tissues as fast as they waste.

Plasma consists of plasmine and serine. The latter resembles ordinary albumen but is *osmotic* (having the power to pass through membranes by osmosis) while albumen is not. Plasma also contains peptones and a coloring matter. In plasmine are also "fibrin-producing factors" which coagulate the blood when it is drawn from the body, and in this property resides our protection from bleeding to death from a cut.

The corpuscles of the blood are supposed to develop from the red marrow of bones and through the agency of certain glands. Upon their normal proportion and number in the blood depends much of the maintenance of health and vigor. If the red oxygen-carriers become too few or lose part of their affinity for this necessary gas a state of "anæmia" results and the individual is *below par.* Certain acute diseases such as diphtheria, typhoid, scarlet fever, syphilis, and many others destroy red corpuscles, and anæmia is also an almost universal accompaniment of chronic diseases of a debilitating or wasting character. Alone and without other disease "anæmia" is capable of causing more symptomatic disturbances than the majority of epidemics, and should always be treated to restore the proper quality of the blood.

The heart is the main-spring of the circulation. The stimulus of the heart's action is the circulation of blood in its substance. The rhythmic action and sound is due to the circulation of *normal* blood through the heart cavities. The heart's action is affected by the density of the circulating fluid, and thin, anæmic blood induces more rapid and feebler beats than good rich blood.

Any local arrest of blood supply starves the tissues of the part. An excess of supply congests a part. A local inflammatory process is nature's effort to eject an invader, and the "leucocytes" which hurry forward to surround the intruder and fight him to death are the white blood corpuscles.

With this comprehension of the make-up of the blood—the most remarkable of fluids—we are now prepared to consider how nature works against microbes, and the authoritative statement which follows is the recent language of the eminent pathologist of the Faculty of Johns Hopkins University, Baltimore.

"It is a well-known fact that the normal blood has of itself, to a considerable extent, the power of killing germs which wander into it through various channels. The tissue cells of the body, in general, likewise show similar action, depending upon the different cell-groups, the state of health, general robustness and period of life.

"The germ-killing power varies in different individuals. Considered as a whole this power which is possessed by the body against germs is known as '*tissue-resistance.*' And when by any means this power of resistance is diminished or lost we run grave risks of incurring disease.

"Granted a case of infection, let us now trace briefly what occurs. Between the period when the bacteria gain a lodgement and that in which the disease assumes a noticeable form the patient simply feels 'out of sorts.' It is during this stage that the blood and tissues are deeply engaged in the attempt to repel the attacks of the invading microbes.

"With varying speed the germs multiply. They may multiply in a local area at first, or may remain localized during the entire disease, or may spread throughout the body generally, according to the character of the infection. Multiplying in the tissues they generate their noxious poisons in increasing amounts and these toxins soon cause profound changes throughout the body. The patient becomes decidedly ill and now shows the signs of unmistakable infection.

"Does the body now give up the fight? No. On the contrary the white blood corpuscles, the wandering cells, and the cells of the tissues most affected, still carry on the fight. From the lymphatic glands and spleen armies of white cells rush to the fray and attempt to eat up and destroy the foe. The disease runs its course and may end in victory for the tissues, and recovery of the patient—or it may end in death.

"If it ends in recovery how are the microbes finally overcome? We have said that with a general infection the body is subjected to the action of generated poisons which are known as 'toxins.' These give rise to such symptoms as loss of appetite, headache, fever, pains and aches, and even a state of stupor or unconsciousness. In addition to the active warfare of the white blood cells, other groups of cells throughout the body, after rallying from the first shock of the toxins, begin to elaborate substances which antagonize the toxins and destroy their action altogether, thus lending aid to the warrior cells which at last overcome the invading microbes and recovery is then brought about."

Under these circumstances the energizing forces of electric currents can do for the tissues what a fresh army would have done for Napoleon at Waterloo. Here is an imperative demand at a given point for an active supply of fresh and vigorous blood, for new battalions of cells, for fighting soldiers, and of abundant plasma to feed them. A properly dosed administration of selected electricity can be made to accomplish this with almost the same certainty that a General can send a reserve regiment to any part of a battle he desires.

There may be a zone of stasis or induration around the centre of the fight so that no new blood can break unaided through the barrier, but we can make electricity *drive* it through—and often it is the only force in medicine or surgery that will do it. Take the visible case of a hard, blind boil; crops of them may come and drugs will not reach their destination or cure the indurated mass. But in a moment we can open the channels of the part so that fresh blood pours through and nature does the rest. A single and momentary application usually cures such boils within a week and the principle is the same in deeper parts of the body.

The second and inestimable service of the manifold resources of electric currents consists in so acting on the fluids, cells, nerves, glands, muscle fibres, and skin, that the toxins will be most rapidly carried out of the body by the most active processes of elimination. Nothing in medicine can compare with electricity for this important purpose. It is absolutely unapproachable.

The third service that electricity can be made to render is to lend support to the general functions of the body while the combat with depressing disease is going on. It can be made (by selected methods) to greatly enhance the nutritional value of food; it can double the restful and regenerating efficacy of sleep; can be made to remove almost all the symptomatic distresses caused by toxins, including pain and nervousness; and will do much to sustain the patient until the victory is won.

The fourth service of electricity in these cases is its efficient restoration of the powers of tissue-resistance and energy when microbes and toxins are conquered and convalescence needs *a decisive tonic.* For information on this point read the chapter on this important period in the early part of this book.

From these pictures of disease and the methods of nature in their cure we ought no longer to have difficulty in recognizing the useful application of electricity to the task of aiding nature. It no longer seems mysterious but entirely natural to expect benefit to the patient with hectic fever, or to confidently rely upon electricity in aiding to limit the tuberculous process. It is no longer strange but obvious to every reader that the most efficient support we can give the tissues in their fight with toxins is the energizing, nutritional stimulus of a selected electric current.

Certainly, an understanding of what sort of a disease consumption is makes it unmistakably clear that nature stands in the utmost need of electricity at every step of the long contest she must wage with the bacillus. To leave this masterful sustaining energy out of the struggle and trust exclusively to the passive help of food, rest, air,—the routines of climate and hygiene—is like condemning a Japanese army to attack Port Arthur with bows and arrows, the weapons of two hundred years ago. We shall endeavor to make this still more evident before we close this book.

# CHAPTER XXVIII.

## SELF-INSURANCE AGAINST CONSUMPTION.

The Fallacy of Popular Teachings and the True Campaign of Education Needed for Individual Protection.

We have now been prepared by the sum of our previous chapters to take a comprehending view of the problem of tuberculosis—the most important subject of this book. It is difficult to crowd a treatise into a chapter and what we can say in the space allowed us will be the merest fragment of the material at hand and the teachings of our experience.

The public stands in greater need of correct and authoritative information concerning the true treatment of tuberculosis than upon any other matter of current health, for with one accord the press, popular magazines, lectures for the masses, pamphlets, and medical journals have been creating an immense and deceptive literature on the subject of consumption. An incalculable number of tracts, circulars, and cards of hygienic hints and the care of the sputum have been distributed by The National and other "Associations for the Study and Prevention of Pulmonary Tuberculosis," but even this literature is absolutely *misleading on the one vitally essential matter of treatment.*

No magazine or newspaper article by any layman, however talented, and however careful he may have been to interview certain medical men, has yet presented the treatment of consumption in its proper light and given the facts the public needs to know. Indeed, many medical and lay writers of undoubted sincerity have been strenuous in proclaiming that there is *no* treatment for this disease, and the majority of specialists in phthisio-therapy, and sanatoria devoted to these cases, announce that their sole treatment of consumption consists in a "hygienic and dietetic system which relies mainly on fresh air and food for its results." The chief organ of outdoor life officially prints the statement at the head of its page that "pulmonary tuberculosis is curable *only* by plenty of fresh air, rest at first and an abundance of nourishing food."

One of the best informed and most earnest of magazine writers (author of three leading contributions to one monthly with "3,000,000 readers") has recently stated: "Whatever recoveries are made from this disease are made solely and simply by the patient's own self.——This terrible toll we pay to the Captain of the Men of Death is due entirely to *spitting.*——It is a *social* problem.——The disease could be put out of business in a very few years by stopping the ill-bred practice (of spitting) which spreads the infection; it can be cured, not by medicines, but by plenty of fresh air, nourishing food, rest, and freedom from worry."

These narrow views, and the whole tenor of the article from which the last remarks are taken, are the dogmatism of men who *think they know*, but who are uninformed about the real facts. In one hour rightly spent the magazine contributor could learn enough to keep him from ever writing another such contribution. The teachings and practice of all such influences upon public opinion are harmful and deceptive because they stop so far short of the whole truth. The last writer quoted says to those who have consumption:

"You for the outdoor life twenty-four hours out of the twenty-four! You for eggs and milk to the limit of your digestive capacity! You for rest, and the carelesss mind, and gentle exercise under medical supervision." That the widespread publicity given to these teachings works against the welfare of patients we shall presently show. Were the matter not so serious, these teachings would be farcical.

In the late autumn of 1905 an "American Tuberculosis Exhibition" was held in the city of New York under the combined auspices of the National Association for the Study and Prevention of Tuberculosis and the Committee on the Prevention of Tuberculosis of the Charity Organization Society of New York. It was planned, according to its printed notice, "as an educational measure in the present widespread campaign against consumption."

It "aimed to show by means of models, photographs, charts, diagrams, etc., the main facts with regard to the disease and its prevention and cure." It claimed to "make a comprehensive demonstration of the facts," but it fell far short of doing it. For a very careful survey of the exhibits showed many measures for the sanitation of the disease but *not a single measure for the therapeutic treatment of a patient.*

The whole educational weight of this important attempt to benefit the consumptive stopped short of telling him a single word of what the sick wage-earner wants to know—*a decisive treatment within his means.* Not a word on this point was to be discovered in the exhibition of models and photographs of sanatoria, tenement-house conditions, and devices for accommodating life to the *slow* processes of nature's healing agencies; nature *unaided by treatment.*

The whole lesson of the ambitious display was sanitation; resting treatment simply upon the effort to place the patient in a sanitary environment in which passive Nature is left to work out her healing of the lungs if she can, without the aid of any decisive measure to give her assistance. This is not *treatment.*

Sanitation *alone* is not scientific therapeutics. It is not doing the best thing possible for the patient. It is not doing our utmost within present medical knowledge to help him or her get well in the shortest possible time and with the least possible cost of money and disturbance of home or business affairs. It is almost criminal trifling with this great problem—a strange neglect of applied science and a curious example of partial ignorance vaunting itself as superior wisdom.

The author rejects nothing that is good in any "hygienic system" but he urges the addition of decisive treatment. And he here affirms (as the result of more than fifteen years' practical experience in the treatment of tuberculosis, that those who still voice the fallacy that outdoor life—the climatic and sanatorium routine—is the *only* proper treatment and the *entire* treatment of this disease, advise their patients to their injury and perpetrate a fraud upon public confidence in their teachings.

As a solution of the economic problem of stamping out consumption the reliance upon the sanitary system and Nature alone is one of the most costly delusions now affecting the public welfare. It is a delusion fostered by lay writers and by physicians who make a one-sided study of tuberculosis and its statistics, but who seek no thorough experience with the new resources of medicine which we call *physiological* agents because they give a helpful stimulus to Nature in a radically different manner from the actions of drugs.

At present the philanthropic, legislative, and medical world seems dominated by this delusion with respect to tuberculosis, and fifty millions of capital invested in the sanitation of consumptives is doing but a fragmentary part of the good it ought to do. The gains are trifling in proportion to the effort put forth, and are utterly pitiful in comparison with what could be accomplished by the addition of decisive treatment to the sanatorium routine.

To-day it is plain falsehood—a gross deception upon a trusting patient—to assert that Nature, in outdoor air, sunlight, and food, possesses the *only* known "cure" for tuberculosis, and that the only way to get "cured" is to adopt an outdoor life; a practical imprisonment outdoors, with phases that are little short of martyrdom to some. The million and a half consumptives in this country now infected and the additional million who may become infected within the next few years need to know the truth regarding treatment, and it should be put before them. It is time to stop calling it the "Great White Plague" and take rational measures to stamp it out.

For the utter stamping out of consumption so that no more will exist in this country is an easier and more practical task than has been the stamping out of smallpox. It calls for no special legislation, for no increased powers of the health board, for no endowment of philanthropy, nor for science to pluck new miracle-working remedies from the unknown. The ample remedies are here. Their application is cheap. All people can avail themselves of the effective resources, and by the voluntary adoption of the means described in these chapters a Policy of *Self-insurance* against consumption can be obtained in every home in our land. The protection of the individual will be absolute.

The difficulties to be overcome in ridding the United States of tuberculosis are largely sentimental and the result of ignorance. Popular sentiment looks at the wasted "lunger" and regards his case as hopeless. The public is told that 150,000 persons per year die of consumption in this country, and despite the educational campaigns of anti-tuberculosis societies the mass of our people still regard the situation as hopeless. "When a man is dying of consumption you cannot cure him."

To "cure" a hundred and fifty thousand victims with cough-racked chests, fever in their blood, and cavities in their lungs, is so manifestly impossible that the despair of the situation sinks deeper into the mind the more it is considered. But is it really hopeless?

On the contrary, we have only to turn our viewpoint, hitherto popularly fixed on the *end* of the disease, to the *beginnings* of it to see at once that it is an entirely different proposition—so different that the solution of the problem of conquering consumption no longer baffles us. To reverse the public viewpoint and action in this matter means nothing short of *revolutionary reform*, and it is as practical as the adoption of vaccination for smallpox.

No responsible physician now disputes that consumption is curable when it first starts. The moral of putting out a fire when it is little and a disease in its earliest stage is exactly the same, and it is no more true of the one than it is of the other that "a stitch in time saves nine." To repair the first stitch that "rips" in a healthy lung is almost as simple to the competent physician as it is to repair the first rip in a stocking, but every mother of a boy knows that there comes a time when further darning of the stocking is out of the question: a little hole does not improve by neglect.

It is just so with several of the mistakenly called "incurable" diseases, of which consumption is the chief and Bright's disease and diabetes are conspicuous examples. At the present time the permanent rescue of the individual from fear of a consumptive's death is merely a matter of seeking proper treatment when the disease is *small*—before the fire gets too big to put out. The sooner the better. No one can buy an Insurance Policy who is half dead with any disease. Self-insurance against consumption must begin while the applicant is still an insurable risk.

At the end of one year of tubercle deposit in the lungs the tissues may still be waging a winning fight against the bacillus if they have a little help. But after three, four, or more years of improper treatment or none at all, the same tissues may be so riddled by destruction, so eaten into by necrotic processes, that the remaining air cells cannot support life, and no climate, or food, or medicine, will have sufficient lung-tissue to work with to then save the patient. Once arrived at the stage of oxygen-starvation the end is rapid, for living energy depends on oxygen as the basis of nutrition. *The importance, therefore, of rousing the public to the beginnings of tuberculosis cannot be overstated.*

The interest of the public in this matter is very great. Forty-five thousand persons visited the exhibition we have referred to in three weeks. Four hundred and thirty-seven thousand circulars and pamphlets on tuberculosis were distributed in the city of New York between January and July, 1906, and a definite effort is being made to educate the people by the "Educational Alliance" for the prevention of tuberculosis. But unfortunately the so-called education is incomplete, deceptive, and lamentably behind the progress of rational therapeutics. In June, 1905, the press announced that "In New York City 2,700,000 posters warning against spitting on the sidewalks and floors of public places have been printed, to be pasted in the school text-books." The energy behind this popular movement could wisely push the spread of far more valuable information on the decisive treatment that will stamp consumption out and reduce the anti-spitting crusade to a fraction of its present interest.

For some inscrutable reason—partly the inertia of rooted prejudice and in part *the opposing weight of the vested interests of established medical methods*—the whole educational scheme in relation to tuberculosis strikes the wrong key-note. At least, it omits the right key-note—the note of *decisive treatment.* It preaches the care of the sputum, the dangers of public spitting, the means by which infection spreads, the value of air, food, and correct hygiene, and right information of this kind is good. We do the same thing in practice and in common with all physicians accept all the benefits contained in these teachings.

But these teachings properly *underlie* treatment; they are not treatment itself. No plausible circular can make them into active curative agents. Such education does not hit the bull's eye of the subject. The vital concern of the nation is not a series of "don'ts" about the sputum. The sputum will take care of itself when there is none left to expectorate. The danger of spreading infection by spitting will cease when the sputum *ceases* under the energetic attack of decisive treatment—and we have seen it cease and the cough practically disappear in less than three weeks in a case that had been under the ordinary treatment of tuberculosis for two years.

Far better would it be if the great influence of the "Educational Alliance" with all its resources of publicity was less concentrated on the sputum and the spitting, and more devoted to teaching something that will do the patient good in the way of arousing an invincible *desire* for early and effective treatment.

*In order to stamp out consumption public sentiment must be swung from the end to the beginning of the disease:* from the time when it is simply a case for hopeless pity to the time when it is easily curable. Nay, to the still more important months when the tissues because of lowered vitality are open to the invasion of the bacillus but before consumption has commenced: to the stage when the cure of tuberculosis is as certain as the cure of an ordinary bronchitis. In this stage the protective self-insurance of every individual is simple, sure, and will cost far less than the cost of neglect.

Doctors have long gilded the diagnosis with phrases calculated to "keep the patient from worry," and to-day this mistaken habit prevents two-thirds of the consumptives in this country from realizing that they have a disease in which their own vigorous assistance must be enlisted if they are to prolong their lives. Learn to look upon consumption as a disease to detect as quickly as you want to detect a fire in order to put it out: not a disease to gloss over by other names until one foot is in the grave and the other close to it. Regard it as a disease to be insured against by measures to maintain the protective vital energy of the tissues; not as something you cannot prevent by your own reasonable and inexpensive efforts. Remember that few people *need* have consumption if they will take a little trouble to insure themselves against it.

Self-insurance against consumption involves but one thing—the necessary raising of reduced tissue-resistance to nearly the normal tone. We have taught the principles in this book. When a "cold" in any part of the respiratory tract does not get well, *attend to it.* Do not stop until it *is well.* It may be an advantage to ask your physician for a frank opinion as to your condition if you think you already have tuberculosis but are not sure. Do not be put off with any but the most candid answer, so that you can make a business of getting well. A known danger can be avoided, but a false security often digs graves for those who dwell in it and neglect their lungs.

But if you had no "cold" at all, or have only what you think is a mild bronchitis, it is useless to ask if you are likely to have consumption. The thing to do is to seek immediate and competent treatment at the hands of some one who knows how to use the resources of electric currents for this purpose, and the reason for this advice is plain: Consumption is a slow disease and requires a long and watchful fight against it. Before the physician puts the patient upon the tedious and uncertain anti-consumptive drug treatment he wants to be sure that his patient has the disease; and before he advises any one to leave family or business and go to an institution for the sanatorium routine he wants to be still surer that the patient has the disease. But in the beginning the diagnosis is hard to make out.

If the physical signs are caused by simple bronchitis instead of tuberculous bronchitis the medical prescription will necessarily be different. In the period of doubt (and this may be many months) the patient is at the mercy of empiricism, for drug prescribing must await the definite diagnosis of disease. Then it may be too late.

Not so with electricity. We need not delay the correct treatment a day. For the general diagnosis is not in doubt. There is known to be an inflammation present in the respiratory tract. The tissues have undergone a deviation from normal which we can make an electric current assist to restore. We do not need to wait till we find a microbe: we can commence a decisive and curative treatment at once. Self-protective insurance can begin (and should begin) before the microbe of consumption enters into the diagnosis at all.

It is, therefore, a useless and perilous delay to parley about the differential diagnosis after some kind of an inflammatory process is known to exist anywhere between the nose and the base of the lungs. The mere opinion of a physician that at the time of examination "no sign of tuberculosis" can be discovered is worth nothing to insure you against the later development of the disease, even if it does not already exist in too hidden an area of the lungs to make any sign of its presence to the physician.

Do not wait. Insure yourself by restoring the tissue-resistance to as nearly normal as possible, and without delay to see if bacillus will grow. Germs may have been lodging in the lungs a year before any appear in the sputum. The way to do is to absolutely disregard all the uncertainties of waiting until sure that you are "consumptive" and *at once prevent your ever becoming so* by getting your bronchitis cured and by raising your lowered vitality to the normal power of the tissues to resist germs. All who do this are safeguarded against tuberculosis. They are self-insured.

Our next chapter will discuss the subject of decisive treatment.

## CHAPTER XXIX.

### THE DECISIVE TREATMENT OF TUBERCULOSIS.

Showing the Practical Means of Bringing the Individual's "Campaign Against Consumption" to a Triumphant End. The Curative Methods Which Should be Added to the Inadequate Climatic and Hygienic Systems of Medical Routine. The Art of Improving on Nature.

At this point we take up the definite and decisive methods elaborated by the author to supplement and increase the curative actions of Nature in combating the tubercle bacillus. Regarding these methods we shall show:

1. They intensify and concentrate the curative physical energies of Nature into the most active and efficient therapeutic dosage.
2. They add decisively to the benefits of all other approved measures of treatment.
3. They can be employed in conjunction with climate, diet, drugs, hygiene, and all other beneficial means prescribed for a given patient.
4. They are applicable to every ambulant case of pulmonary tuberculosis, in any stage and however complicated, and can be used by all physicians who desire.
5. In states of the disease now recognized as curable they are the most decisive means by which to arrest the progress of consumption and most quickly restore the patient to the best obtainable degree of health.
6. When employed too late to arrest the disease they are the most decisive and satisfactory means of relieving symptoms and affording comfort to the incurable patient.
7. Between these two stages of consumption they will most efficiently prolong life, maintain freedom from suffering and energy to work, and control or prevent relapses.
8. They are safe, effective, free from disturbing actions, agreeable

to the patient, harmless in medical hands acquainted with the technics, and have no contra-indications.

The results of treatment when these methods are added to other measures are so superior to the results of any other plans of treatment without them that we follow the above with two other affirmations for the guidance of interested readers:

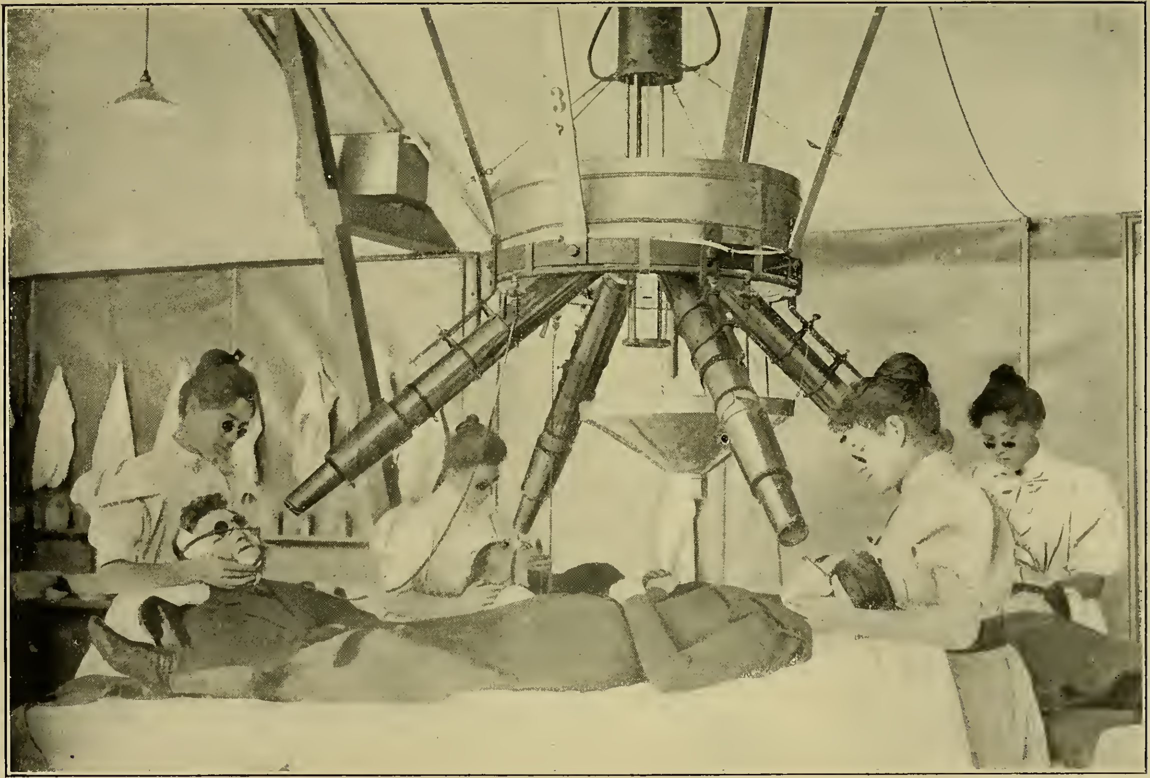
(*a*) *No consumptive patient should accept any treatment anywhere, either at home or in a tent camp, sanatorium or hospital, which does not include the decisive actions of selected physical agencies as set forth in this book.*

(*b*) *Any physician, hospital, sanatorium, or institution devoted to the treatment of pulmonary tuberculosis without adding the competent administration of these physical agencies (by approved methods) betrays the trust of patients, disregards their welfare, and should be considered guilty of malpractice.*

In discussing the subject of treatment for consumption we shall begin at the beginning. For most people this is the prescription of the family physician, and so far as it may consist of drugs we have this to say: More than two hundred drugs have entered into the treatment of tuberculosis. About ten of them have been considered important, and several of these were once thought curative. Drugs have ceased to be seriously prescribed as curative agencies and no longer enter into treatment except for symptomatic relief. It is now the accepted axiom of the medical profession that medicine will not cure consumption. Any patient taking medicine as a "cough cure" is deceived. But as palliatives, and for the proper treatment of some complications drugs can assist the patient though they cannot destroy the bacillus.

At frequent intervals the press announces a "serum" for the cure of consumption. A number have had many tests and none are curative. The likelihood of a serum cure is remote, notwithstanding the enterprise of German laboratories and the skill of German science. The nature of the pathology of pulmonary tuberculosis does not seem to us to be adapted to the reach of a serum. If a successful antitoxin can be applied to this disease we shall welcome it, but there are many difficulties in the way of producing the proper antitoxin.

Diet, foods, fats, nutritious alimentation, need no remark here. The stomach is said to be "the house we live in" and all treatment of tuberculosis is based upon nutrition. Every doctor will advise



THE FINSEN FOUR-TUBE LIGHT APPARATUS

This photograph, presented to the author by Dr. Finsen, illustrates the method of treatment of lupus at the Copenhagen Institute. Each patient is in charge of a nurse. The application is one hour, daily. Colored glasses protect the eyes from glare. Rock crystal "compressors" secure penetration of the cooled actinic rays, which have the required chemical action on the tissues.

his patients about it, but to limit treatment to excessive feeding alone is a great injustice to confiding patients.

But “climate” is a different and more perplexing matter to readers. For a poor woman with five small children to be told that she must go at once to the Adirondacks, or a $16.00-a-week clerk with a family to be ordered off to Denver, or for a struggling boarding-house keeper to be told by her physician that if she does not leave New York she will not live three months, excites dismay and the true facts should be understood.

For many years climate was mistakenly supposed to be curative, but the sad histories of State after State that in turn became the “Land of the broken-hearted” testify to the failure of this remedy for tuberculosis. The bubble of “climate” has been pricked and the public should know it.

When climate was first exploited a specific quality of air was deemed essential, and in turn almost every variety of climate—damp, moist, dry, warm, cold, sunny, cloudy, rarefied, pine-scented, snow-covered, sandy soil—was certainly the best. Then purity of air was thought more essential and it was sought on the ocean, the mountain, and the plain.

Next followed the dictum that the climate must be the one in which the greatest amount of outdoor life could be carried on, hence a dry, sunny place was preferable. Finally, the last stage of the discussion was reached when advocates of the open-air treatment declared that quality was immaterial and that the main thing was *abundance*—open air twenty-four hours of each day.

Many frank reports have been published in medical journals of the past ten years, but they have not reached the public. In a contribution entitled “The Fallacy of Climate,” an excellent physician writes: “This error concerning climate is the most cruel and least excusable of the many that have been woven into the history of this disease.” Even oxygen itself, necessary as it is to support life, does not exert specific curative actions on tuberculosis, and climate is a palliative rather than a means of cure.

Patients who thrive in regions of pure air droop when they leave it, and tissues fed on the best of air do not seem to gain the power to do well on inferior air. The exile of the consumptive is either futile or permanent, and a recent magazine article by a Southwestern writer says the last word needful on this subject:

C “limate has ever been the traditional cure for consumption

. . . (but) it must be an irrevocable decision to leave behind the North and East forever and to accept the Southwest as a bourne from which no pilgrim permanently returns.

"The poor, hopeless and nearly helpless sufferers in the third stage when the lungs are eaten away—there is no recovery for them here. The sooner we confess the limitations of nature the better for all concerned.

"It cannot be too frequently repeated that the advice to 'live on a ranch' is, in the majority of cases, the rankest nonsense. Looked at in the most hopeful way country life here is hard, lonely, unstimulating, and many a man has ridden back to the towns preferring to die quickly while he can enjoy the remaining hours rather than add to the number of his days in solitude.

"In a 'tent city' there is pure air, but here the advantages cease. The daily routine is dreary. There is little or nothing to do or to amuse. Lack of control is a great evil. Many tent-residents lacking diversion become gloomy and depressed and so move on before any permanent improvement is effected. In all the large cities there are hospitals, but the consumptive (unless in the last stage) does not need a hospital—he needs a home. This home he cannot find in the great Southwest. Outside of the government hospitals ninety per cent come to the Southwest too late and sixty per cent of these die."

Therefore, a physician who understands this disease—and the majority of physicians in other branches of practice understand it but little—will never advise a patient to leave home for the mere sake of climate. Such advice is *prima facie* evidence that the giver of it is not worthy of confidence in the management of a case of tuberculosis. Fresh air—air that has not been breathed repeatedly—is wanted by consumptive patients, and it can be got most anywhere if the desire to get it exists.

The region where the patient will get well quickest—get well so that he can *live anywhere*—is the region where he can secure the best treatment by the addition of decisive measures to the elementary routine of modern medical practice. The factor that best decides the result is active and decisive treatment and not the passive submission to any climatic and hygienic conditions alone. It is not enough to put the patient outdoors into fresh air. We must enable the tissues to take up the benefits of the air, food, rest, exercise, sleep, diversion, hope, and all the elements of cure. And this brings us to speak of the great defect in the present methods of the more than two hundred and fifty institutions for the sanatorium treatment of tuberculosis in the United States.

Take any one of them: for example, the "New York State Hospital for Incipient Pulmonary Tuberculosis in the Adirondacks." The so-called "treatment" is officially stated to "consist mainly of outdoor air, wholesome food, and rest." With variations in language the advertising circulars of phthisis sanatoria in general make the same claims for "treatment," and this is called "The climatic and hygienic system."

We have no quarrel with this system, which has certainly marked an immense gain upon drug "cough cures" and the "cod liver oil and creosote" formula of the author's early days as resident physician in a hospital for consumptives and as clinical assistant in the department of heart and lungs in Bellevue. Our charge against those who *restrict* their treatment to this system is that they do not go far enough.

They stop short of the decisive treatment that the patient needs. They are behind the knowledge of up-to-date medical progress and they fail to employ the best means at their command. This failure to give the patient the best aid of up-to-date medical knowledge, in the light of published facts and clinical experience, borders very close upon discreditable malpractice; for no excuse remains for any of the profession to plead that the actions of physiological agents have not been made known. Text-books and special medical journals contain ample information where all who desire may read it.

The radical change that is required in every institution and in private practice dealing with consumptives is to cease to depend upon the unsupported administration of a "diet-rest-cure" and the physical agencies of nature in the diffused densities in which they are adapted to normal living; for routine practice of this kind is like driving a horse with *one* rein.

The necessary thing to do is to employ (*in addition to the best of other measures*) the best means which modern invention has provided to *intensify and concentrate the administration* of these physical agencies—mainly light, fresh air, electricity, warmth, modified exercises, etc.,—in such ways as to most effectively adapt them to the decisive treatment of tuberculous patients.

All the chief difficulties in the way of doing this have been solved, and scientific apparatus exists in abundance and is readily obtainable for the potential employment of every resource in Nature's laboratory. They have been fully tested and the clinical demonstrations of their value are indisputable.

These methods of *improving on nature* are of extreme interest, for they supply the only means developed since Hippocrates advised fresh air of solving the problems of tuberculosis. Many still search in the clouds of theory for a specific serum, but the practical remedies belong to earth.

First in importance is *Light*, for no high grade of life flourishes without light to nourish it. Germs detest light. It destroys them. They thrive in the dark bedrooms of the tenements and the unventilated quarters of the poor. Hence one of the first injunctions in the management of tuberculosis is to get light into the houses and get the patients out into the light.

But this is a mere hygienic precaution and ordinary diffused light stops far short of active treatment in these cases of urgent need for *treatment*. In order to apply potential medical actions to diseased tissues a sufficient number of light-rays must be collected to create an efficient dosage, and this must be so directed through the tissues that certain desired effects will be set up within them. From Finsen's Light treatment of lupus to our own treatment of tuberculosis (an hundred-fold more important to mankind than Finsen's work) the broad pathway of scientific progress in the medical applications of intensified light-rays is lined with ingenious inventions to increase the skilled physician's armamentarium.

A score of reasons restricted the medical uses of sunlight, which shines most where fewest people live. It is not everywhere and always available, and least so in the physician's office where his instruments of precision in dosage are installed. But modern science has given us the electric "sun" which never sets, never goes under cloud, and in the darkest room furnishes us with a brilliant, unvarying light of any desired power from 100 up to 60,000 c. p., and with exact control as to composition of spectrum, intensity, and manner and localization of administration.

Moreover, for rapid curative efficiency the penetrating rays of light must be applied through the uncovered skin, a condition not suitable to outdoor treatment even if no other drawback to solar radiations existed. A clothed consumptive or typhoid convalescent can bask in outdoor light for the entire day with less tonic penetration of ozonizing beams into his internal tissues than he can now obtain in fifteen minutes' focussed application of intensified light in a well-equipped office or institution. In the course of three months' definite treatment the difference to the average patient is tremendous.

At the Buffalo Exposition in 1900 the "Tower of Light" was the crowning masterpiece of Edison's great pupil, Stieringer, whose daring conceptions of creative genius found their first opportunity in the "Court of Honor" at Chicago. By a strange irony of fate his collaborator, the gifted Henry Rustin, on whose executive capacity depended the carrying out of the dreamy schemes of Stieringer, fled from his Pan-American labors with tuberculosis without once suspecting that the very agent which won his triumphs in architectural illumination had the power to also triumph over his disease. Still more remarkable, Stieringer died of consumption later.

Chapter eight in the early part of this book explains the medical actions of this great health-giving agent, one of the contributing factors in the author's decisive treatment of phthisis. For various reasons direct exposure to sunlight is not a leading feature of sanatorium methods, but the physician who fails to employ the more active and dosable resources of *photo-therapy* for the benefit of his patients is behind the times and neglectful of a most potent aid.

Next to light is *oxygen*, the great respiratory gas and the essential ingredient of life-supporting air. We grant all that the imagination may claim for the value of pure air to the consumptive—our aim is to make it *still more valuable.* As fresh, pure, oxygen-laden air is the foundation of health it certainly is essential to the restoration of health when it is lost. No one disputes this, least of all the physician.

But when disease attacks the breathing apparatus of the body, as does consumption, we have an additional point to consider and that is the ability of the unaided lungs to take in sufficient air to feed the blood and tissues. Oxygen can do a man good only in proportion as he gets it in him, and this is a matter that most physicians overlook and no patient takes into account. Yet it is the central keystone to decisive treatment.

For, suppose we send a consumptive to the pine forests of the Adirondacks or the dry plains of New Mexico to *breathe;* how well can he do it when he gets there? Will his lungs expand and let his air cells fill with air? Or will half of the air cells be collapsed, or filled with purulent mucus, or destroyed by the inroads of the bacillus? In other cases the chest expansion may be limited by pleuritic pains, or the motor mechanism of his respiratory muscles may lack energy and thus lessen his oxygen supply. The lungs cannot open and shut themselves to take in and force out air any more than a sponge held in the hand can squeeze water out of itself.

It is the muscle-power of the thorax, squeezing the chest walls down to deflate the lungs and expanding the chest walls to inflate them, that does our breathing for us. The lungs distribute the oxygen to the blood but are as passive as a sponge in the act of respiration—and this is why they need help: the help the author gives them in his treatment of consumption—the help that the present advocates of routine systems ignore.

The rule is that these patients cannot fill their lungs with air unaided, and therefore the best air in which they can be placed falls far short of its potential ability to do them good simply because the lungs do not get enough of it into their damaged cells. From Saranac to Arizona this is true of all climates and all diseased lungs. And the fact indicates one weak point in relying upon the crude and slow "outdoor life" system.

Leaving a damaged lung to "nature" without proper assistance is like leaving a hungry man in a bake-shop with his hands tied. The first thing to do is to untie his hands so he can feed himself. With the consumptive the first thing to do is to untie his lungs from anything that limits breathing. If the pain of pleurisy makes a full breath hurt, relieve the pain at once and correct the pleurisy. If the muscles of respiration are weak, give them more energy and reinforce their powers of contraction and expansion. If the cells are full of exudates, help nature to get them out. If the heart is weak, tone it up. If toxins depress the whole system, eliminate the toxins. Do everything necessary to support the apparatus on which breathing depends so that the patient can take in deeper draughts of healing and nourishing air and profit by an increased absorption of oxygen.

This is quickly done by means of modern appliances and the utilization of high-potential and high-frequency electric currents with the author's methods. The improvement wrought in the patient's ability to breathe cannot be appreciated until it is witnessed or experienced. It constitutes one of the basic features in the author's "decisive treatment of consumption"—a treatment to which the word *decisive* is strikingly applicable. This technique alone would, if it was universally employed, add a very large per cent of value to the routine sanatorium system. Patients who are deprived of it are not treated decisively.

But the "fresh air" question has more to it than that. It has another side which is entirely passed over by the advocates of Nature's cure and the outdoor life. Air is composed mainly of one part of oxygen in four parts of nitrogen. The healing and tonic agent in fresh air is the oxygen which it contains. When two atoms of oxygen are made to unite the combined atoms make a more active oxygen gas ($O_2$) and this is the great respiratory antiseptic—*ozone.* Simply oxygen doubled on itself, and as a nascent, free gas more than doubled in its curative energy.

By subjecting either air or water to certain actions of immensely high-potential currents of electricity it is possible to disengage the oxygen atoms at will and cause them to re-unite as nascent ozone. This gives the physician an oxygen product of many times its former energy to apply to the healing of inflamed mucous membranes, and all inflammations and ulcerations of the skin and respiratory tract.

It is the most powerful and the safest destroyer of bacteria we possess for internal use. It does not wait for the "cold on the chest" to become consumption, but exerts its benefit in all grades of catarrhal bronchitis and coryza. It is also, in a watery solution, the great external cleanser and healing agent. When the surgeon wishes to cleanse a wound of pus, destroy bacteria, and promote a healing action in the tissues, he now applies ozone in the convenient form of dioxide of hydrogen. It has intense germicidal activity in suppurating conditions—and pulmonary tuberculosis is a suppurating condition in the lungs.

A watery solution cannot be applied to the lungs, but the inhalation of ozone in the convenient form of a dioxide of nitrogen (if we may so call it) is just as practicable for the patient as is the respiration of ordinary single-atom oxygen in the ordinary air. And this is a phase of the author's "decisive" treatment. It reaches the innermost air cells with a stimulating, healing, and tonic action; and as the vesicles and bronchioles become gradually cleared of clogging exudates the ozone can better bathe their lining walls and act still more beneficially than at first.

While these helpful actions are going on in the lungs of the consumptive whom we thus treat, another important thing is taking place. He is enabled to "raise" the sputum with far greater ease and more rapidly clear his lungs of poisonous accumulations of diseased matter. The "tightness" of the chest loosens, the tenacious stickiness of the exudate changes into freely expectorated sputum which in time is got rid of and less forms and the residue of expectoration becomes serous and soon ceases in the favorable progress of the case.

At the same time there is an abatement of the cough by the natural healing of the irritation which causes it. The annoying "hack" stops, and the only cough left is the useful means of clearing the cells of sputum. Within a very short time (often no more than one or two weeks) patients who have been coughing forty to sixty times at night reduce to a dozen, most of these near the hour of rising after a good night's sleep. The frequent cough by day gives place to far less frequent clearings of the throat and a few expulsive coughs, all without the fatigue of previous paroxysms. In due time there is no more cough at all in a progressing case.

To practically "turn a patient out to pasture" in the often cruel and tedious outdoor system (sometimes indirectly as cruel as prison confinement) without aiding him in these respects is obviously a great injustice to the unfortunate victims of the exclusive "climatic and hygienic system." The definite relief of the cough and the freeing of the exudates, with gradual cessation of both as their causes are removed, mark two striking points of the superiority of *decisive treatment* over the delusive theories of those who leave the patient to "Nature" only.

Drugs called "expectorants" free the tenacious mucus to some extent, but possess none of the curative actions of physical agents, and too often contain an opiate for the cough which hastens the downward journey of the consumptive. Cough remedies are mainly some product of opium, and the chief are morphine, codeine, and heroin. The latest insidious alkaloid of opium is disguised to the public by the new name of *heroin*, but is none the less masked morphine and the enormous use of opium is one of the greatest evils of drug treatment. Electricity will relieve the cough and gradually remove it with an efficiency that is beyond the power of any other means in medicine. It has no drawbacks. To deprive the coughing patient of its comfort and healing ease is like robbery.

Auxiliary to these and all modern methods of treating tuberculosis are three basic necessities—food, rest, and exercise, and each of these can be abused, overdone, or wrongly employed. Nutrition is one of the great fundamental demands in the presence of the consuming wasting of the consumptive, and in the usual routine much stress is laid upon eating. Three full meals a day and two or three luncheons are urged upon patients, and the selection of the most nutritious articles of food receives the attention of dietetic specialists. In New York a medical school and hospital began in 1898 a special clinic for tuberculosis in which the only treatment for attending patients is a "dose of fat twice a day," coupled with advice to eat at home the proper necessary additional food. In some cases this is amplified by rest.

But crowding food into the stomach is not the whole of nutrition. Nor does a "tonic" to increase the appetite insure the absorption of true nutrition by the tissues. The consumptive is benefited only by the amount of food he digests and absorbs. Some have good appetites, some have poor appetites, and in some cases appetite for a time is lost. When the appetite is poor, the effort to carry out injunctions to eat the advised quantity, especially of fats, becomes one of the most distasteful burdens of the consumptive. But with the help of electricity this cause of complaint is almost always soon removed.

Nature is slow to improve a lost appetite in these cases. She is especially slow to improve an impaired capacity in the metabolic processes of the blood-vessels, nerves, muscle fibres, and glandular organs. But we can readily use Nature's own remedies and her own principles of action with an intensified dosage and give great assistance to the power of the tissues to take up the nutrition from better relished and more completely digested food. Unless this is done all other attempts at treatment find their efficiency reduced by this weakness at the foundation of the structure.

We have before us as we write a column and a half press story of the "feeding clinic for the consumptive poor," and the satisfaction expressed in the method illustrates how narrow are most of the popular views on that portion of the treatment of tuberculosis. To assert that the exclusive dietetic method, no matter how carried out, is a superior and complete curative method of treatment, is like asserting that a coat is a complete suit of clothes. The ignorance or prejudice that hedges in such a "system" is offering the poor a stone instead of real bread, and to exploit so narrow a means of partial treatment and claim that it is the chief of curative systems lays its advocates open to ridicule. The effective way to treat the poor will be set forth in our next chapter.

Rest and exercise are two valuable prescriptions in the wise treatment of tuberculosis, both of which must be regulated by proper medical judgment. But "imprisonment on a porch" is not necessarily "rest." Idling about a local climatic resort for consumptives is not the kind of rest wanted. You may place a patient in a reclining chair on the sunniest or shadiest of verandas for many days without securing physiological rest when impaired nutrition has made the blood anæmic and the heart is thumping laboriously with feverish haste. To trust alone to nature and imagine that the patient is resting therapeutically because he or she is lying down or sitting still is one of the time-wasting errors of the exclusive hygienic system of dealing with tuberculosis. As a factor in genuine treatment it is folly. Those who exploit it ought to know better even if they do not. Rest and over-feeding can degenerate into abuses.

The net result of months of combined hyper-feeding and rest under the popular system is this: The patient, in a favorable case, takes on weight. This is the measure of gain. Ten, twenty, thirty, or more pounds of flesh is put on outside the lungs and it is supposed that the lungs are then greatly benefited by this increased "nutrition." But the flesh is *soft.* It has a low tissue-resistance. It is easily taken on and *as easily lost.* The weight of many fluctuates more or less during the period of treatment and little added strength is gained with the weight. The patient "rests" off his energy. The muscles get out of the habit or desire for use. A little walking makes the patient "short of wind."

Three months, six months, a year, of this system sees some patients at a standstill, some pronounced "improved," or "arrested," and some who show a loss of ten or fifteen pounds instead of the desired gain. The plan is wrong and does relative harm. Nothing but closely maintained ignorance of better methods could ever inflict it upon suffering and deluded patients. When they leave the institution where they made the fictitious appearance of improvement they are apt to lose it on their return home. They lose it because the gain is not genuine benefit. It is as little permanent value to many as pine wood on a coal fire. It does not last. It burns out quickly.

But apply to such patients the decisive measures that they need. If they have hectic fever, hasten the elimination of the toxins that cause it. If they are easily fatigued, tone up the heart and toughen the muscles. Attack the low vitality of the flabby new-made flesh and make it take on a higher tissue-resistance. What trainer would train a man to fight the champion of the Prize Ring by ordering almost complete idleness (rest) for every muscle in the body? Yet the consumptive fights a more formidable foe than the erstwhile Sullivan in his prime. He needs every bit of "fitness" that can be imparted to him and soft and flabby, easily tired, and non-enduring muscles are not "fit" for much of a fight. The rest system is a grotesque parody upon medical wisdom. But it is hard on the victims of the practice. To urge "rest" so long as the patient has temperature and do nothing to eliminate the cause of the temperature betrays an almost mediæval incapacity in treatment.

*Exercise* is more to the point. Yet in the main unaided exercise is a broken reed to lean on. The patient in a State Tuberculosis Institution may be carefully graded along a gentle path from rest to gradual exercise—from three minutes' walk a day to two hours', three hours', or any amount of exercise that the routine may order. But he often does not "feel like taking it." Gets tired too easily. Laziness grows on the tissues, and they instinctively avoid work.

Moreover, under the plan of the hygienic system you may tell the patient to take prescribed walks or perform any of the routine gymnastics that are advised, but injurious fatigue is the penalty of overdoing, for in these cases the heart is taxed by every voluntary effort of the motor centres. The mind is also fatigued in the process. One hour of overtax of the body at a critical time, say the advocates of the routine, "may set the patient back for weeks, and can even mark the dividing line between probable arrest of the pulmonary process and a definite course downward to the end." A deadly dull routine is not inspiring to the tissues.

What injustice then to trust a patient entirely to such precarious methods of treatment. The uncertainties of exercise and hazards of fatigue are needless. To avoid them and build up the strength of the muscles and heart is one of the gratifying results in our decisive treatment of consumption. For science has given us the most beautiful and effective means by which to exercise, tone, and reinvigorate the motor centres and muscle fibres with no voluntary work on the part of the patient.

There is no tax upon the heart: it is given relief. There is no fatigue or risk of it: the energy is increased. In a single week an ordinary curable case (not in the wasted and hopeless cavity stage) will feel a desire to walk (as before he shunned it), and will say, "I don't get tired now. I enjoy walking." No method which fails to utilize these means of strengthening the energies of the body can do the patient justice. They supplement all other measures of correct treatment, whether the consumptive remains at home or is the paying guest of some distant sanatorium. To deprive the tissues of the aid of electrical energies is like depriving plants of rain and sun.

In the decisive treatment of tuberculosis each patient must be treated according to his or her individual needs. There can be no wise *routine*. The same symptom may be due to a variety of causes. Precise remedial actions must be applied to precise therapeutic indications, and what fits one case may not do at all for the next. But we have never seen a case that was not amenable to *relief*.

In the incipient class, the only class desired by most institutions for private patients, a single month of decisive treatment will usually remove the physical signs of the disease more completely and beneficially than two to six months of the climatic and hygienic system. In the middle stages of the disease, each month of decisive treatment will mean more genuine benefit to the average patient than several times that period of the hygienic routine. In the third stage and down to the last week or so of life the relief afforded by physical measures is not approached by the action of any other means known—barring those complications which put the patient in bed where non-portable apparatus cannot reach him.

In contrast with *decisive treatment* may be placed with startling shadows the undisguised admissions of the exclusive hygienic routine. In a current issue of the chief journal of outdoor life, a writer runs a page of comment from "The Idler on his porch." A new Patient has come for "ten days." The commentator ridicules the idea and goes on to show how days pass into months and the once N. P. is likely to see six months run into a year. "It takes four or five years to heal the lungs" is the statement of one prominent advocate of the outdoor system.

A question which readers may ask, and which has been asked us repeatedly in the past, was put to the author on May 26, 1906, by a patient who had been five months at a large sanatorium for the treatment of incipient tuberculosis—four months before he began to feel any benefit, and he left because his "relief from shortness of wind was so very, very, slow." Said he: "Why is it they are so down on electricity at W——? The doctors there say it is no good. They say it destroys the tissues. How about that? Is that so?"

On May 28, 1906, another patient (one also recovering from tuberculosis, and under decisive treatment making more rapid progress each month than the first had been able to make in five months without it) reported a conversation of the evening before with a surgeon connected with the newest and most costly of the great hospitals of New York. The patient had been telling the surgical acquaintance how he had been benefited himself, and of the benefits to several others whom he knew. A fragment is enough to quote:

Surgeon:—"Well, you know! We haven't got time to use those sort of things. I know, of course, that electricity is good in some cases, but it takes a lot of apparatus and a good deal of trouble, and we can't do it in our line of work."

Patient:—"They are improving apparatus so much and going so far ahead that I expect they will soon be saving people from a lot of surgical operations by giving them internal treatment with electricity."

Surgeon:—"*Is that so?* What, then, will become of *my* profession? You can't expect me to favor anything like that. Oh! no. That would never do. I must talk against that sort of thing. It won't do at all."

This may throw some light on the question of the patient two days earlier. But what of the true interests of the public and the individual patient? What of the relation of the medical profession to those who trust it to do what is best regardless of anything but the patient's welfare? Turn to the fine sentiment to the class of Bellevue Medical College (from which the author graduated when it was at its best) and compare the theory of an Address with the practice of a surgeon. Any medical man who will "test all things" must test electricity in medicine, and if he "holds fast to that which is good" he will never let electricity go. Nor will his patients.

To adhere strenuously and exclusively to the present passive routine methods (which are not active treatment) is like seating a patient beside a high board fence and telling him to lift himself over it by pulling on his own boot-straps. To add the resources of decisive treatment, puts a lever under the same patient and makes it vastly more possible for him to reach the top of the fence between him and restored health. This, in a nutshell, is the aim of the author's teachings. To combine all that is best for the patient: not merely restrict him to the slow, passive, tedious, uncertain, and non-decisive rest-climate-diet-cure without adding the efficient means of producing far better results in far less time.

To put it another way: if a man has fifty cents we add another fifty cents to his money. We do not take anything from him, but increase his capital. If the invalid with a long journey to go has just enough funds to buy food while he travels slowly on foot, it is the purpose of *decisive treatment* to *add* to his resources so that he can get home quickly in a Pullman car.

The way to accomplish what is required for a given patient is to first ascertain the condition of the lungs, the important organs, and the general state of the patient. The next thing to do is to decide upon the nature of the therapeutic actions that must be *set up in the tissues* in order to remove the causes of symptoms, correct the symptomatic disturbances, energize the nervous functions of the body, improve metabolism and the work of the different organs, and as fast as possible to clear away the barriers that have prevented Nature from healing the lungs.

Then begin the work of setting up, in turn, the actions that are necessary to help the tissues do the things the patient needs to have done. The organic tissues of the body are the means of giving these actions their necessary effects, just as the strings of a piano give effect to the act of the hand that strikes the keyboard with the desired notes. By external impulses of selected kinds each physiological property residing in each variety of tissue and organ can be stimulated to do improved work. Electrical tools and technics are our practical means of "striking the keyboard of the nerves" so that the internal tissues will respond with the desired therapeutic actions.

To set up these actions as they are needed we must select the suitable *tool*, and must use it in the proper way. A carpenter will not take up a saw to drive a nail, nor will he use a hammer to plane off the rough surface of a plank. By the guidance of exactly the same principle of adapting the tool to the work we make the hundred tools in the resources of electricity the means of carrying into practical effect *the decisive treatment of tuberculosis.*

To stamp out the disease will be the subject of our next chapter.

# CHAPTER XXX.

## THE AUTHOR'S PLAN TO STAMP OUT CONSUMPTION.

Practical Information for Philanthropists, Legislators, Health Boards, Charity Societies, the National Government, Federations of Labor, Fraternal Bodies, and all Organizations Interested in Suppressing Tuberculosis.

Along present lines neither legislation nor philanthropy will ever stamp out consumption. They make little impression upon it, and their efforts are futile because they are wrongly directed. With right direction the same amount of yearly outlay and effort would accomplish wonders. In this chapter we shall show what should be done and how to do it.

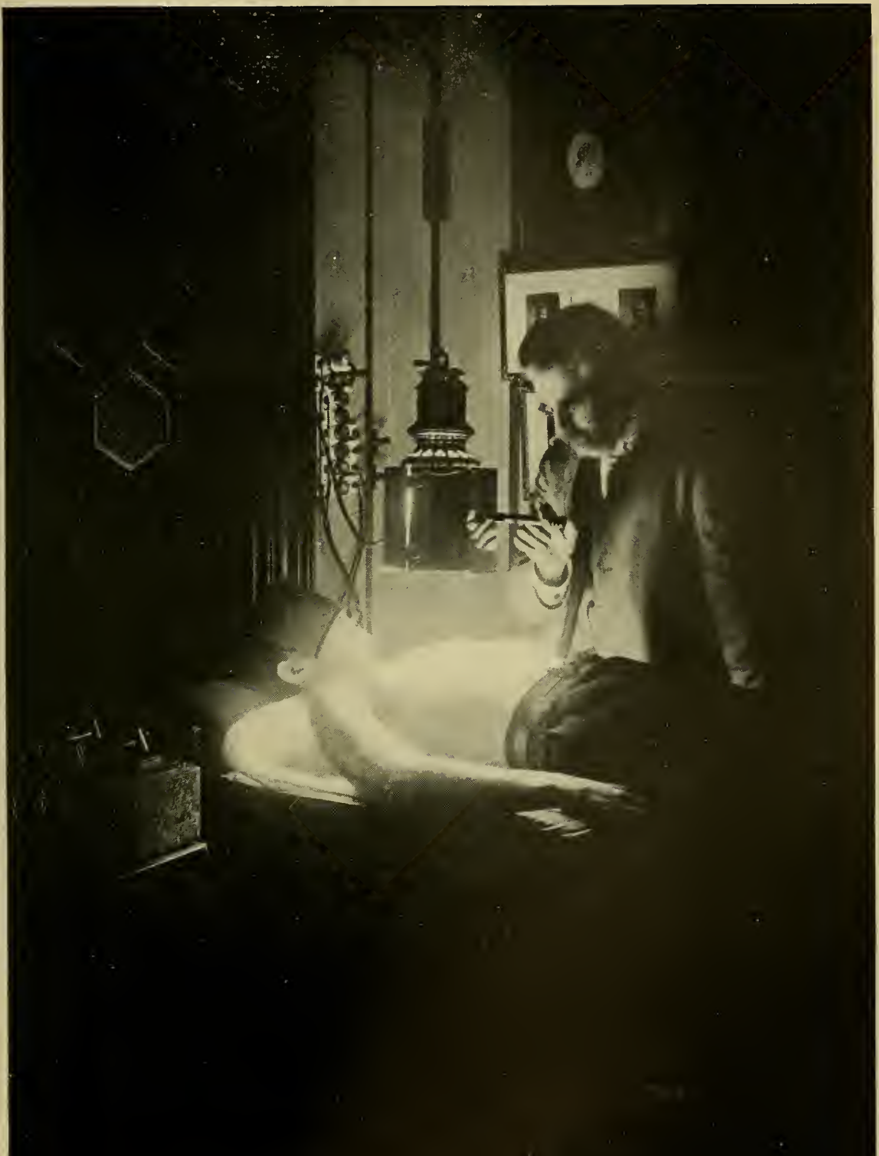
Every year New York State loses about 14,000 wage-earning units of population by the passing along of the tubercle bacillus from the man or woman who will die of consumption this year to the man or woman who will accordingly die of it a few years hence. The number of deaths remains about the same for a series of years. Few of the poor are treated until too late and little ground is gained.

New victims become infected and constantly fill the gaps in the ranks of the diseased. Thus, for every 14,000 who die at the end of their contest with the "White Scourge" a new 14,000 *begin their first year* of struggle with the same foe, and will pursue about the same journey to the same end. That is, they will, unless a plan is put in operation to prevent it.

Two things can be made to stop this fatal repetition, and nothing else will. First: The general adoption of known means of intensifying the curative agencies of Nature and the addition of *decisive treatment* to the present passive sanitation of this disease.

Second: The restoration of normal tissue-resistance in individuals with predisposing states of unsound lungs, the removal of the predisposing condition making the development of consumption impossible.

The first of these is immediately practicable; the second re-



LIGHT RAYS IN THE TREATMENT OF TUBERCULOSIS

Showing the technique employed with the author's "Sunshine Lamp" of 500 cp. It is so mounted as to raise or lower and swing over any part of the patient. A single picture cannot illustrate the various modifications of method required in treatment of different patients. Light in concentrated and intensified dosage is one of the factors in the decisive treatment of consumption.

quires a campaign of education. Before discussing the education of the public we will canvass the ways and means of treatment for the masses.

In putting into effect this decisive addition to the prevailing hygienic and dietetic efforts to combat tuberculosis, there are four divisions of the medical work required to be accomplished: Public institutions, dispensaries for the charity poor, private sanatoria, and family practice.

In Institutions, prisons, asylums, homes, etc., in which consumptives reside or in which inmates become infected, the solution of the plan is entirely within control of the authorities in charge. They should install the necessary appliances for improving on the slow processes of nature and subject every susceptible case to decisive treatment until tissue-resistance is raised to the protective normal. This should be made compulsory in penal and charity institutions of all kinds. It involves none of the objections that oppose vaccination among the ignorant. It is not open to the objections of taking medicine. And no new cases of tuberculosis will hereafter develop in institutions managed in this way. The treatment of existing old cases in the same way will best keep them under control and limit the infection of others.

For the poor of large cities the existing clinics, dispensaries, and hospitals for charity work should be equipped to meet the demands of their various localities. Keep the dispensaries open day and evening to accommodate wage-earners of all kinds. Teach the poor that prompt treatment with these agencies will save them from the "wasting sickness," and they will soon learn to seek help at the beginning of a "cold" when a few visits will suffice. By the united influences of police, clergy, and the medical profession, together with the resources of the Charity Organizations, the poor can in due time be taught the financial profit of keeping consumption from stopping their work. The results of decisive treatment will be satisfactory.

The various private sanatoria in the country designed for pay patients should provide the same essentials of equipment and expert skill in their use. The same principles apply to pay patients as to the poor, and the results amid the better conditions would astonish those who now point with pride to the statistics of their hygienic system alone.

But the greatest gap in the chain of protective and stamping-out measures remains—the family physician; the first to see the patient and the last to supply decisive treatment. Not two per cent of the general public resort to institutions for assistance. They rely upon two hopes of cure—the family doctor and patent medicines. Few will dispute that patent medicines are an evil, but what is the consumptive to do—with his cough and his chest and his failing strength? On the one hand is the travel-or-die theory urging him from the home he cannot leave. On the other hand, his family physician "only doses him with drugs" and will promise nothing.

His health fails. The patent medicine holds out the only promise in sight. It promises everything. The rescue from this situation is obvious. In every small town there should be at least one equipment of up-to-date apparatus for the effective treatment of respiratory diseases—consumption and the states that lead to it. As these appliances are useful in the treatment of nearly all chronic diseases met in general office practice, the investment will have many ways by which to justify the cost, so that the initial expense is of no consequence whatever in a campaign to stamp out consumption.

In large cities there should be many practitioners equipped with appliances and skill for this special work. Physicians should act together, and the one who discovers a lingering respiratory lesion which does not clear up under his medication, should send his patient at once (and as urgently as if cancer threatened) to the colleague who is better prepared to restore the sound state. The aroused patient will be grateful—glad to be rescued from consumption.

Now let us look at the cost. Whether private practitioners and institutions invest two or ten thousand dollars in apparatus is of no concern here. A fairly good private equipment will cost about $5,000.00, but what sum will it take to stamp out tuberculosis among the poor? An official circular states that there are 140,000 consumptives in Philadelphia. The same ratio would mean 300,000 in New York, many of whom are unaware of the true nature of their disease. A large part of these cases must be treated at the city's expense in free dispensaries. What we must here consider is the cost of this to the tax-payers.

In a tenement district a dispensary room can be fitted with cheaply finished but well-made appliances (limited to absolute essentials) for about $500.00. With two well-taught nurses this equipment can give fifty patients a day efficient and decisive treatment—far better treatment than is to-day given in the most renowned sanatoria of the world, not excepting the celebrated Nordrach.

In crowded districts two, three, or more sets of similar apparatus should be installed, with a capacity as great as needed. With the dispensaries open the entire day and evening each of them can treat from 50 to 500 patients daily. This means from 100 to 1,000 different patients per week, as only three visits a week would ordinarily be required. Only the worst cases must be treated daily.

The duplication of such equipments throughout the tenement districts where most of the tuberculous poor dwell is the cheapest and most practical way to solve the problem of their treatment. Compare, for instance, the number who can be treated per day and the superior results obtained by this method with the two-million-dollar institution which the city of New York is now building on Staten Island. Only the positively helpless should be placed in such a building, and the pro-rata cost is excessive. The cost of the building alone would equip the enormous number of two thousand dispensaries, each fitted with $1,000.00 worth of efficient apparatus.

With a capacity of one hundred patients a day these dispensaries would be able to give efficient treatment, embodying the best known resources of modern medical science, to two hundred thousand tuberculous patients, or four hundred thousand different persons per week! The mere mention of the figures illustrates the wastefulness of institution treatment for the working classes.

Other figures impress still more forcibly on the mind the economy of our dispensary plan. In one Massachusetts semi-charity sanatorium for consumptives (treating 350 patients) the investment in property is $475,000.00 and the annual running expenses are $95,000.00. In New York State a new charity institution raised $250,000.00 to start it and at last accounts it had 62 patients under treatment. In another private institution with a semi-charity annex (a $500,000.00 plant) the number of patients has been as low as fifty-five. In most of the numerous State sanatoria the legislature appropriates from two to three hundred thousand dollars and the number of patients rarely exceeds one hundred and fifty.

Besides these figures it must be remembered that every patient so treated is separated from friends, family, and business, and in order to get such inferior treatment must stop all other occupations in life—a tremendous economic waste. As most private sanatoria advertise only for "incipient" cases (curable in a few weeks by decisive treatment) this showing of cost and sacrifices to patients is a formidable indictment against the slow processes of nature in the routine system.

Under the plan here set forth these same patients can be more successfully treated at home with small expense and allowed to continue the occupations which support their families and themselves. Put in a nutshell, fifty million dollars is now accomplishing a small fractional per cent of permanent good in the combat with tuberculosis. By the adoption of the plan here suggested a much less sum could sweep the country free of the tubercle bacillus in little more than ten years.

And now let us see what *popular education* is needed to bring these things to pass. The fatal error of the present is the concentration of recognition and treatment upon the last stage of the disease. Scarcely anybody thinks he has consumption until he is half dead with it. The necessary and revolutionary reform must swing this recognition back from the end to the beginning, and then from the beginning of the actual disease to the folly of letting a mere "cold" lead to a consumptive's grave. For no more needless waste of life can be cited.

There are a million and a half consumptives in this country. One hundred and fifty thousand die each year, yet the ranks keep full. The average duration of the disease may be called (for comparison) ten years. One half the total (750,000 persons) have been infected from five up to ten years and are mostly incurable in the medical sense. But modern methods of decisive treatment can prolong their ability to work, and can relieve their symptomatic sufferings down even to the last month.

One hundred and fifty thousand other persons are in the middle period of infection, the borderland between the possibility of arresting the disease and the certainty of the usual end of phthisis. Much depends on treatment, and decisive measures can lend many of them an added term of life and comfort.

In due time all the above of the living generation will be eliminated from the consideration of permanent protection to the community, but while they are gradually being removed by nature, the aim must be to restrict their infection of others. Regardless of an admitted "incurability" the value of decisive treatment in these cases is beyond estimate.

We now near those closer to us—the three hundred thousand now passing through the second and third year of tuberculosis. Will they stop or go on? The answer rests with decisive treatment. In eighty per cent of them the downward progress can be checked. This is the advantage of early treatment—the patient can then be CURED. A little fire is easily put out. Make every one realize this. Teach it to every child. Practically none of these 300,000 will infect any one else after they begin their proper course of decisive treatment, and at this point we therefore enter upon the practical stamping out of the disease. We stop the fatal repetition that perpetuates it.

By thus following the course of tuberculosis backward from the advanced stage upon which the public gaze has been chiefly fixed —*mistakenly fixed*—and arousing attention to the far more important beginnings of the disease, we next come to one hundred and fifty thousand individuals whose infection has begun within one year; while behind them marches another 150,000 ready to enter the ranks of the infected next year and take the places left vacant by the annual dead.

Almost every one of these will succumb to tuberculosis under the present misdirected education of the public. By making early attention to the disease the popular fashion (so that neglect will be a disgrace) almost every one of these cases can be rescued from the fatal bacillus and placed in a state of safety in one or two months—some of them in two weeks. Treatment is more decisive and more certainly curative in these commencing months than it can ever be again, and the true campaign of education should arouse the community to the sure rewards of early treatment and the effective stamping out of the disease. None of this army of 300,000 will pass the disease on to others, if they are themselves taken from the ranks of recruits by preventive treatment.

It is true that the circulars and advertisements of sanatoria and health boards now urge incipient cases to seek treatment, but the slow, uncertain, and tedious methods offered will never rouse a popular revolution where indifference, ignorance, and scepticism now reign. But news of a decisive treatment could be spread rapidly.

It is useless to argue against active conditions and offer only a passive remedy. Sanitation is useful, but it will be the work of decades to reform community conditions in which the crowded tenements live. The practical thing to do is to apply a treatment to the individuals needing it which will enable them to tolerate their environment and resist infection as well people do—to give them a tissue-resistance which will make ordinary conditions harmless.

There are said to be 360,000 dark interior bedrooms in New York City, but the application of light-rays, ozone, high-potential electric currents, etc., in a proper dispensary will do more to improve the health of the tenants than any crusade to improve the tenements. "Education" of the poor is necessary to rescue them from tuberculosis, but the first thing to do is to provide decisive treatment: then teach them to profit by it.

The people are eager to learn, but they feel little interest or confidence in much of the present anti-tuberculosis literature, most of which is worth nothing positive to the man who has consumption. The same effort and money put into the following "campaign of education" would rapidly stamp out the disease.

First, let the family physician make it a matter of professional pride to detect in his patients the conditions which foster tuberculosis, warn them of their possible danger, and enlist their co-operation to easily and quickly check it rather than to gloss over the matter as is now almost universally done.

Teach the public that it is plain murder to let an incipient case of tuberculosis develop into the hopeless stage under the fatally deceptive phrase of "a slight touch of bronchitis." Let the future development of a case of consumption in a person previously well bear with it the stigma of disgraceful neglect. Let a "stamping out" campaign be begun. Make it by popular teachings as much the habit to stamp on the first appearance of consumption as on a snake.

In schools, in churches, in public lectures, in popular writings, and in constant and reiterated emphasis in the daily press preach the doctrine of *decisive treatment and protective tissue-resistance.*

Correct the false teachings of the "hygienic" school and make it known everywhere that fresh air, rest, and nutrition are *not the only* requirements of the consumptive, but are the foundation on which the actions of decisive treatment build. Make known everywhere the fact that modern science now enables us to intensify the slow actions of Nature and to double her benefits in a quarter of her time.

Do not neglect the rising generation. If not protected, it will supply the future victims to the tubercle bacillus. Teach all school children that insurance against consumption will rest in their own hands when they grow up. Teach them that the sole requirement for positive safety is to keep up the natural resisting powers of the body and lungs. Teach them to avoid the common folly of neglecting a "common cold," and to realize that "a stitch in time" saves not only nine but will save them from the deadly ravages of consumption.

The School Board in every town and city should have the teachings of these facts incorporated into the routine of the year's work, so that every child would be regularly drilled into a realization of the proper attitude toward tuberculosis and the simplicity of escaping it.

Let clergymen embody the same teachings in several sermons per year, preach it, lecture it, and talk it as second only to the gospel.

Let the press take up the theme and never drop it until the scourge is stamped out. And under this campaign of education it will not take long. Ten years will accomplish the greater part of the work.

This education of the public would represent a greater gain to the welfare of the community than any medical advance since the discovery of vaccination; and the knowledge should be put within reach of all.

To practical philanthropists, to the National Government, to the legislatures of every State, to the fraternal societies, to the management of hospitals, asylums, prisons, and sanatorium institutions, and especially to general family practitioners, we commend what we here say upon the solution of the problem of tuberculosis in the United States.

The suggestions stated form a perfectly feasible improvement upon existing methods. They call for no radical innovation in principle. They involve only a moderate addition to the sums already invested in hospitals, institutions, and dispensaries for the protection of the community from the infected poor. They demand only the wide adoption of methods which are now benefiting hundreds in a few hands, and their application to the decisive benefit of hundreds of thousands in many hands.

The results would be far-reaching. The yearly recruiting of 150,000 by new infection will be stopped. New soil for the bacillus will cease to abound. The older victims of the disease will gradually pass away, leaving few followers in their wake. When the last of those now infected are removed there will be no more consumption here save what we import, for the maintenance of higher tissue-resistance will banish the soil in which the disease prospers and the bacillus will die out—*the disease will be stamped out.*

Within ten years from the general adoption of this plan the sun will rise on this nation with every community in its borders swept free of tubercle bacillus and the problem of tuberculosis will then be permanently solved.

# APPENDIX

# CHAPTER XXXI.

## A WORD TO ELECTRICAL ENGINEERS.

We have recently listened to this surprising dictum from one of the lights of a very brilliant profession: "We Electrical Engineers not only do not know that these things are done with electricity—we do not believe that they *can be done*."

Facts are not altered by the ignorance of anybody concerning them. It does not affect the ability of a current to drive a trolley car or to excite an increased circulation in the capillaries of a part, for any one to say that they do not believe it can be done. The medical profession has been slow to learn the facts, but the electrical engineer should not be the one to doubt them.

At the present stage of medical progress scarcely any patients are treated with electric currents until the resources of internal medicine have failed. In many chronic cases the failure of medicine has extended over five, ten, or twenty years. Now, let us take any hundred cases of chronic disease in which the best of medical treatment has made 100 per cent of failure—if electricity can benefit any of the hundred it is a good record under the circumstances, for medicine has been unable to satisfy any one of them. The facts of our long clinical experience are as follows:

1. Skilled technics enable electricity to produce brilliantly successful results in 50 per cent of the cases in which the failure of medicine has been total.

2. In an additional 25 per cent of the cases electric currents can be made to afford a grateful amount of relief, though disappointing as to cure.

3. In the remaining 25 per cent of cases in which medicine has entirely failed to satisfy the patient, electricity can do little; some cases being beyond human skill, some of them not persisting in treatment, some being so situated that they cannot do treatment justice, some belonging to the "impossible" class met in all grades of society.

These are not figures of the imagination but the facts of a considerable number of years of actual work, doing the things we here affirm that we do with electric currents.

The simple explanation is that results which are difficult to obtain with drugs, are often especially easy to obtain with physical agencies—the cure of lumbago is an example—just as the effects of drugs in their best sphere of action accomplish things that electricity cannot approach.

In one of the writer's text-books for physicians the alphabetical index contains over 350 items under the head of treatment, representing the clinical work of galvanic, faradic, and static currents with high-grade apparatus and the best technics known. Is it possible that so much can be *done* with electricity? Yes, for the book mentioned is a treatise of work actually done by the author and his responsible colleagues, and every word of it is true, and less than the whole truth. For it has always been our rule to keep so far within the maximum of our demonstrated work that no critic could attack the record.

But the electrical engineer reads this list with wonder that so much can be stated in behalf of a single remedy. Here are fifty, a hundred, diseases: will electricity "cure" them all? No. Alone, without competent apparatus, a great variety of electrodes and accessories, and without the direction of a master of correct technique, electric currents have little spontaneous action in the cure of diseases. The trained technical staff of a great electrical industry can well afford to grasp the significance of technique in medical treatment even though they know nothing of medical methods or applications.

But, first, there are not 350 or even 100 diseases under consideration. Under normal conditions health is the proper working of a few physiological processes; mainly a half dozen. These are each liable to a change in the rate of their regular action. A functional process may thus be increased in its activity, or diminished, or temporarily stopped.

If the rate of change from normal is very marked, the result is called "disease," and even germ diseases, poisons, and injuries produce their results by their effects on these same processes of nature. By giving a different name to different degrees of disturbances of these different processes, and still different names for the different local tissues involved, the Fathers of Medicine have coined nearly half a thousand titles for the purposes of differential *diagnosis.* For instance, one increase of rate of function serves as the foundation of "inflammation," yet a hundred names will not cover all the "diseases" of this one type.

Now, "Nature" *tends* to "cure" all really *curable* diseases herself, and in many cases she succeeds. *How* does she do it? By having command of so many remedies for so many different diseases? Not at all. She simply tries to restore the normal rate of the deranged functional processes—one or more of the main half-dozen—and if she succeeds the state of health is resumed, no matter what one of fifty names the "disease" may have been called.

Here we strike the key-note of the therapeutic resources of electricity. It is a potent means of regulating the function of any one or all of our few physiological processes when unaided Nature is unequal to the task.

Therefore, to restore health in any given case of local or general increase, decrease, or arrest of a primary process, the physician ascertains what process is at fault and in what way it is at fault. This is called "Diagnosis." The next step is to decide what actions upon or within the tissues are required to regulate the rate of function to normal, and finally, the physician prescribes the remedy to meet the *indications*—that is, he selects the particular remedy which he can make start up the process of Nature if it is arrested, increase it if it is diminished, reduce its rate if it is over-excited, and re-establish the conditions of regular functionation.

The physician is taught "Therapeutics" to enable him to do this, and if he selects the right remedy the patient is benefited. The word "therapeutics" signifies the art of applying *remedial agents* to the treatment of disease, and includes all remedies, not drugs alone. In acute diseases drugs are most often efficient, although some diseases run their course despite drugs. In chronic diseases drugs are least efficient, and owing to the limited action of any one drug, or the fact that a drug with the exact action desired may not be known, it is often impossible for the physician to select a prescription which will restore the deranged processes to normal work.

But in the "therapeutics" of electric currents we teach how to make them set up definite actions in the tissues with almost the exactness of a surgical operation, for we work with mechanical tools and with definite methods. If the condition is restorable to a physiological normal state, electricity can be *made* to do it if the doctor knows *how*. Whether the condition can then be held at normal depends on the energy of the "cause" that put the process out of its proper balance in the system. If the attack is stronger than Nature's energies in defence, a permanent "cure" will not be obtained. In cases of this kind the patient is often grateful for improvements that fall somewhat short of entire cure, and in most chronic diseases which are not malignant we can remove the worst of the suffering and establish an improved state.

The main actions that are demanded of physical agencies—the medical resources of electric currents—when they are prescribed for the treatment of disease are:

An increase or decrease of the blood supply of a part of the body—the part affected.

An increase or decrease of the rate and power of the heart and circulation.

An increase or decrease in the processes of secretory cells.

An increase or decrease in the rate or extent of the oxidation of food.

An increase or decrease in the contractile function of muscle fibres.

An increase or decrease in excretory processes.

Adjustment of the processes of absorption.

Adjustment of the heat-producing centres of the body.

Regulation of the nerve centres to normal action.

These are the things that are behind the majority of *symptoms* and the sufferings of chronic diseases. The doctor who can control these underlying disturbing causes of symptoms will remove the symptoms, and the patient will feel well in proportion to the completeness with which the functional processes of the body can be restored to normal.

Therefore, apart from the selection of a drug as a specific antidote to a condition on which it will directly act, the selection of remedies is not addressed to the names of diseases but is made according to the primary process that is out of working order and the action that is needed to set it right again. This is quite different from the general impression of the public and must be understood before the place of electricity in medicine can appear rational.

*Electricity commands its high place in modern medicine solely for the reason that by means of competent apparatus and proper* *technical skill in methods of dosing and directing its amount, rate, force, quality, extent, and character, the trained physician can make selected currents and selected methods increase, decrease, or otherwise modify, each and every physiological process that is within the reach of human skill and influence.*

Only the reader with a medical education can grasp the whole philosophy of this statement, and only the physician who has been taught to know electricity as he has been taught to know drugs, commands the instrumental skill to make electric currents do these things.

You put a harness on a horse, but you do not give him his head to let him go where he will. You drive him north, south, east, or west, to your selected destination, and you make his gait and speed obey your wishes if you are an experienced driver. So we must do with each and every electric current in order to make it set up exactly the quality and amount of action that our *diagnosis* tells us the tissues require for their relief. Whether we are considering diabetes, or kidney disease, or tuberculosis, or bronchitis, or a boil, or a sprain, or gout, or paralysis, or rheumatism, or insomnia, or "nervous prostration," there is but one scientific principle of applied therapeutics, and that is as above stated. It covers both surgery and medicine.

But, no doubt, part of the public distrust of electricity springs from misuse of the word *cure*. In Germany we read that people take the "cure" at leading health resorts every year. They are seldom cured—they are simply *treated*. The so-called "Kurhaus" of Germany is simply a treatment-house. Physicians do not promise cures when they treat a patient—certainly not when they are treating a very difficult chronic disease.

Competent authors discuss the treatment of patients with electricity, but in their books they cite the results that may be looked for from proper treatment and none of them *overstates the results*. An index showing a hundred conditions of disease subject to beneficial treatment by physical remedies does not certify to the cure of all of them. Misunderstanding will be greatly reduced if this word is abandoned when it is out of place.

Another point respecting the mental attitude of many laymen toward medical writings calls for a little remark. We refer to the vague and wholly unfounded notion that the value of electrical forms of treatment is constantly exaggerated by "enthusiasts" who write about this branch of medicine—the sceptic appearing to think that none but "enthusiasts" ever write about it at all.

But every author of repute among his professional colleagues is ultra-conservative. He has to be. He can usually perform much more than he writes up. The "exaggerated writings of enthusiasm" *do not exist.* As editor, author, teacher, and clinician, we have been obliged to examine with care the contributions to electro-therapeutic literature of almost every physician of standing during the past century, and especially during the past decade. But in these writings we find no trace of overstatement and look in vain for claims that cannot be substantiated by proof. In various respects we can ourselves demonstrate much more than either our own writings or the writings of other physicians set forth to represent the value of medical electricity.

We have yet to see the book that does full justice to this agent. Personally, it is our general rule to understate by at least twenty-five per cent in clinical reports of the results of our own treatment, making this allowance to offset any possible error of judgment in estimating the benefit to a given patient. What I have written of my own work *I know to be absolutely true.* Much of my work has been done before classes of experienced physicians and no question of veracity can occur under such circumstances. With five previously published books, many special contributions, and instruction papers, circulated among my colleagues, my reputation would not endure for a day unless my position was maintained by practical demonstrations of results.

During the most active era of *x*-ray experimentation it was especially the habit of outside writers to assume that the workers in this field exaggerated reports and made undue "claims" for this agency. The actual facts are shown in an editorial written by the present author, January, 1904, from which we quote:

"To prepare the text for this issue we have personally examined about all the printed matter of the past year on the use of *x*-rays, and we are struck by the fact that every writer takes special care to protest that he is conservative in his statements, has allowed for all possible errors, and makes no 'claims' beyond the self-evident present results. The guarded nature of the writings of those who speak with the authority of experience and of high repute in their medical position stands out like a great rock on a plain. Nothing can tempt them into risking professional ridicule by rushing ahead too fast."

As we read and revised more than two hundred articles on the subject of $x$-rays during the years 1904–05, our opportunities of knowing the character of "claims" made by actual workers were second to none.

Barring advertisements of commercial devices made to sell to the public it cannot be shown that any medical literature from the pens of responsible practitioners makes any excessive claims for the value of electricity. Unless the critic can produce evidence in support of his assertions his imputation against the veracity of many distinguished physicians who are daily demonstrating and confirming the great value of this agent reflects upon his candor and partakes of mere prejudice.

No honorable electrical engineer will fail to see that the position of mere scepticism without negative proof is untenable in the face of positive proof from scores of indisputable sources. As evidence of his attitude toward the desire for truth on the part of any who want to *know* what electricity can be made to do in respect to the treatment of diseases, the author submits the following proposition to all whom it may concern:

If the doubters of the value of medical electricity will appoint a committee of investigation consisting of twelve competent physicians, none of whom shall have been in practice less than ten years, and all of whom shall be antagonistic to the medical uses of electricity, the present author will donate his services and time to assist in carrying out the following campaign of education:

The medical committee to supply a suitable room or rooms, preferably in connection with a large hospital in New York City.

The author to equip it with competent electrical apparatus.

The medical committee to supply suitable clinical patients to the number of not less than twenty for each session, for a period of three months. Sessions to be on two afternoons per week, from two to five o'clock.

The medical committee to examine each patient and present same with the diagnosis to the author for such treatment as he may deem indicated.

Full notes of the cases, treatment, and results, to be made and published in leading medical journals. All possible precautions to be taken to protect patients from the influences of "suggestion" or any mental bias during the period of their treatment.

The results of such an investigation ought to settle something. The outcome of it would tend to surprise the committee if very rabid haters of electricity are secured—and they can be found. To the great army of chronic sufferers the outcome would be a boon, for the results published by the committee should mean the *release of the profession from prejudice and a new birth to therapeutics.*

# CHAPTER XXXII.

## THE CENTRAL STATION AND MEDICAL USES OF ELECTRICITY.

CURRENT-CONSUMING devices for the modern physician multiply. Electrically operated therapeutic apparatus constitutes the backbone of progressive practice in the general field of chronic diseases which are treated in the physician's office. There are 150,000 physicians in the United States and Canada. Their office treatment of patients is mainly done between the hours of eight A.M. and five P.M.

At the present time a few hundred have an extensive equipment; a few thousand have one important apparatus and some minor devices, and the total number estimated to include all who have any kind of "battery" down to the cheapest, is 25,000. There are about twenty principal manufacturers of therapeutic apparatus and fifty smaller firms supplying the trade in these lines. Within ten years the growth of the business has been rather a hint of what is to come than a gauge of the market. A full development of electro-therapy in this country ought to see as broad a field for current as for surgical instruments—nay, a still broader field, for taking one year with another, a hundred persons need electricity where one requires a major surgical operation.

Chronic diseases care little for drugs and these patients go from one doctor to another and consume much money in patent medicines and travel. At least $50,000,000.00 of American money goes to Europe every year in search of health. Modern electrically operated apparatus supplies the remedies which form the main hope of the medical profession in their desire to rescue the public from the evils of this patent-medicine habit, a traffic of over $100,000,000.00 a year in the United States; and they offer the only efficient aid to those who wish to save the expense of a trip to Carlsbad, or Nauheim, or any other foreign competitor with home treatment.

Physicians who stick to drugs and advice cannot give all their patients all the benefit they want with drugs only, and the addition of the leading physical agents will become an increasing necessity as their merits are better known. As the primary battery cell will not take us far in the use of high-efficiency apparatus the central station supply of current for both light and power is already indispensable. As both physicians and central-station managers will be interested to know something of the current-consuming values of selected apparatus, a little condensed data will be given here.

Beginning with small things, the usual "Wall Plate" or switchboard with controllers which adapt the street current to the so-called galvanic, faradic, and sinusoidal medical currents, the electro-cautery, and light for small diagnostic lamps, consumes under ordinary use about the same amount of electricity as a 32 c.p. incandescent lamp.

Static machines, vibrators, oscillators, etc., when of proper medical efficiency, require motors ranging from $\frac{1}{6}$ h.p. to $\frac{1}{2}$ h.p., and one office may use from five to ten such motors.

The high class *x*-ray coil of the Ruhmkorff type has an ammeter register of from 8 to 25 amperes of current, in exciting tubes.

When such coils are used for High-Frequency work they run on a lighter current of 10 amperes and under.

Smaller apparatus without electrolytic interrupter will operate on 220 to 440 watts.

Apparatus for the medical uses of light-rays cover an extensive range. The "Bidet" and a dozen special localizing appliances, for the spine, abdomen, knee, full leg and arm, etc., each consume from 300 to 500 watts during treatment.

The "Sunshine Lamp" of 500 c.p. is the standard device for important forms of Light treatment in both general and special practice. Incandescent lamps of this capacity take about 12 amperes or 1.3 kilowatts to operate. With the two smaller lamps of this kind used—400 and 300 c.p.—the consumption of current is from 990 to 770 watts. The 500 c.p. six-glower Nernst lamp makes a splendid instrument for the same purposes and uses about one-third of the amount of current.

Single large arc lamps with reflectors similar to searchlights are made and mounted for medical uses, particularly for treatment of diseases of the chest. They are made of various capacities, ranging from 25 to 80 amperes. The consumption of electric current runs from 3.75 K. W. to 8.80 K. W. The arc-light apparatus of Finsen is of a radically different construction. The full Finsen 4-tube apparatus will consume about 6.60 K. W. The small single-tube models for private practice use about 550 watts. Several other lamps compete with the small Finsen model and use about the same current.

"Arc-Light Cabinets" for non-sudatory light baths usually have two lamps taking either ten or fifteen amperes each. The consumption of electric current in these cabinets is 1.10 K. W. to 1.65 K. W.

The Combination Light Cabinet of the author's model, containing three arcs and twenty-four incandescents, has a current-consumption of 3.20 K. W.

Incandescent Light Bath Cabinets are usually supplied with a greater number of lamps and some earlier models had as high as 120. Most of them now use under fifty lamps and concentrate them closer to the tissues than formerly. In the author's model a localizing device permits a concentrating adjustment upon the chest, abdomen, knees, etc., besides the general field of radiations around the patient. Both the author's models of improved cabinets have the "bidet" seat with rays reflected directly through the floor of the pelvis. The ordinary consumption of current in this form of instrument is from 1.32 K. W. to 2.64 K. W.

A few institutions, led by the example of Finsen, have experimented with large arc lamps using 11 kilowatts, with the idea of treating a larger number of persons at one time in an "electric solarium."

Besides these users of electricity for light and power, the need of motor-generators and transformers occasionally arises to enable the practitioner to adapt his feed supply to other special apparatus. This list does not by any means cover all the current-using devices that may enter into medical practice, for men who specialize along certain lines often have special apparatus made by local workmen, and these are not referred to here.

One item representing the teachings of experience is that in installations for electro-therapeutic apparatus (even those using small amounts of current) every cut-out should be a knife switch. Snap switches are unsuitable for this work and are prolific of irritation and trouble. In addition to any cut-outs on apparatus using heavy currents, there should also be a knife switch in a convenient place on the adjacent wall.

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